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Rhodora

JOURNAL OF THE

NEW ENGLAND BOTANICAL CLUB

Conducted and published for the Club, by

MERRITT LYNDON FERNALD, Editor-in-Chief

JAMES FRANKLIN COLLINS
CHARLES ALFRED WEATHERBY } Associate Editors
LUDLOW GRISCOM

VOLUME 37

1935

The New England Botanical Club, Inc.
8 and 10 West King St., Lancaster, Pa.
Room 1001, 53 State St., Boston, Mass.

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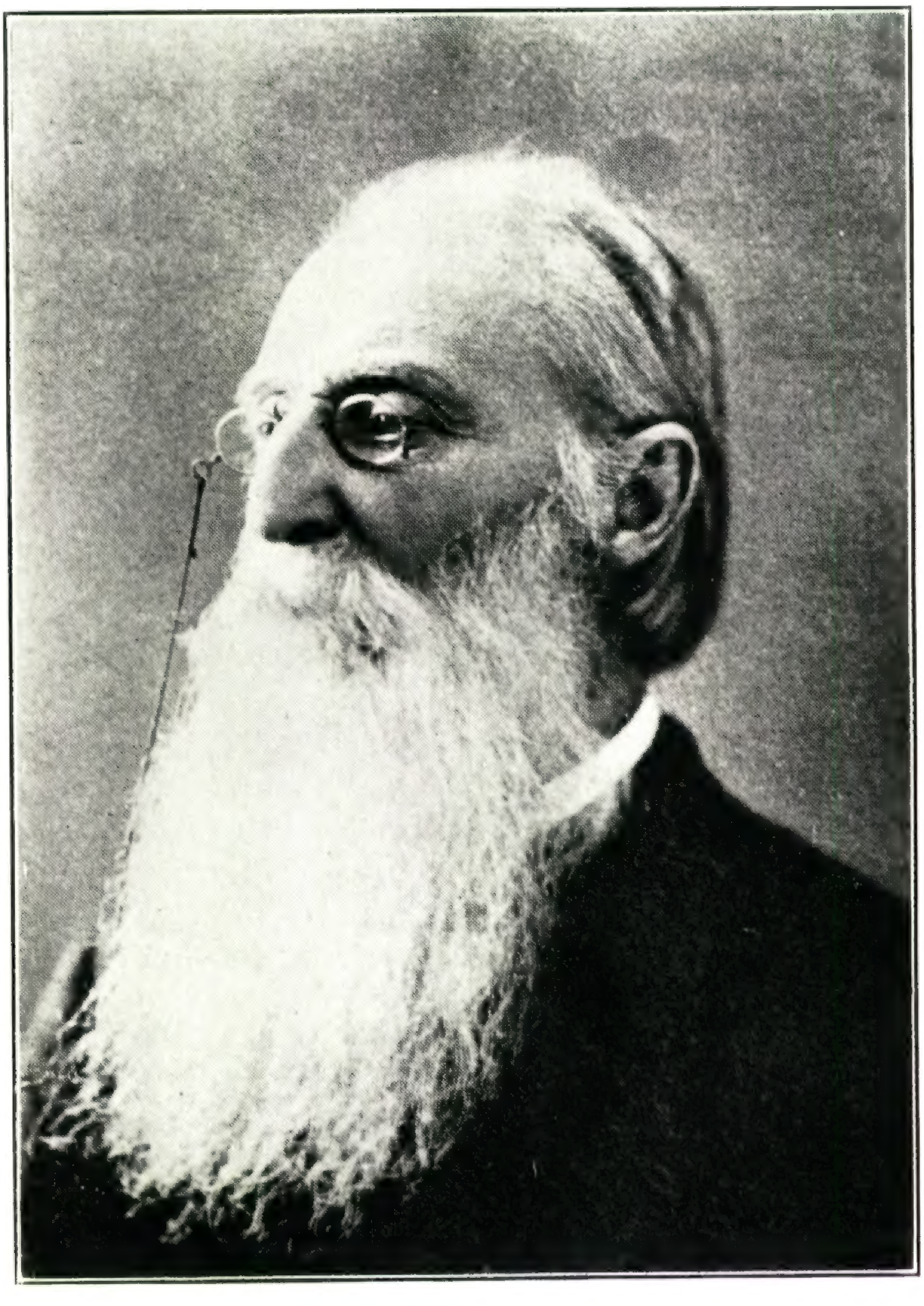

Yours cordially

Rhodora

JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 37. January, 1935. No. 433.

DR. AARON YOUNG, JR. AND THE BOTANICAL SURVEY OF MAINE

ARTHUR H. NORTON

(With Portrait)

ON THE third day of July, 1847, John W. Dana, Governor of Maine approved a resolve appropriating the sum of six hundred dollars for a botanical survey of the State. Somewhat after midsummer the same year, Dr. Aaron Young Jr.,[1] was appointed State Botanist to carry out the provisions of the resolve.

The report filed with the Governor by the State Botanist was not published as a State document, a matter contributing to the cloud of obscurity which has long enshrouded this transaction.

Dr. Young and the persons whom he associated with himself in the field work of the survey appear to have been among the first to explore the whole length of Mount Katahdin from the north end to Monument Peak, and first to publish accounts of their observations, the first to show definitely that the summit of the mountain harbored an extensive true alpine flora, the first to make a representative collection of the commoner plants of that flora[2] and the first to apply dis-

[1] At a meeting of the Maine Historical Society on February 27, 1913, Dr. James At Spalding, biographer of the Maine Medical Association, read a biographical accoun. of "Dr. Aaron Young Jr., Maine's first Botanist." A note from Dr. Spalding to the present writer January 13, 1913 gives the following analysis of that article." "My plan is a life [of Aaron Young] with intercurrent notices of his medical services. I shall not expand on Ktaadn or on anything botanical, but leave that to you." The writer of this paper would gratefully acknowledge the wise advice and the help of Dr. Spalding in bringing to light the facts connected with the subject here presented. Dr. Spalding's manuscript in the archives of the Maine Historical Society has not yet been published.

[2] In August 1845 Dr. Edward Everett Hale and Wm. Francis Channing made an excursion to Katahdin by way of the North end; they ascended by Katahdin Stream,

tinctive names to several of the prominent features of Katahdin. Also he was the first to attempt a comprehensive collection of the marine algae of the State of Maine, and the first to survey the hardwood forests of York County.[1]

Aaron Young, Jr., was born in Wiscasset, Maine, December 19, 1819, the son of Aaron and Mary Colburn Young. Aaron Young, Sr., was the son of David Young, a pioneer of Pittston, Maine, and Mary Colburn Young, mother of Aaron, Jr., was the daughter of Oliver Colburn, son of Captain Reuben Colburn, who furnished batteaux for Arnold's expedition to Quebec. Aaron Young Sr., was Justice of the Peace and Coroner 1821–1823 at Wiscasset, and held the title of Justice of the Peace at Bangor for a number of years subsequent to 1829, and for a longer time that of Surveyor of Lumber at the important port of Bangor, then the metropolis of the lumber industry in Maine.

Aaron Young, Jr., was schooled at Gorham Academy and Teacher's Seminary. This was followed by two years at Bowdoin College and finally attendance at Jefferson Medical School in Philadelphia, where "he was graduated in medicine." At Bowdoin College, he was so deeply devoted to the sciences of botany, mineralogy and chemistry, that Professor Parker Cleaveland made him Assistant in Chemistry.

By his own statement it appears that he spent two years teaching at Paris, Maine, "part of the time associated with our friend, and part of the time as Principal. We did all we could to keep the institution alive and think our interest was deeply appreciated. The Aesthetic assemblies established by ourself were the scholars pastime, instructive and amusing. We hope they are now continued. We wish our friend and the institution all sorts of success." (1854 "Diarium" in Touchstone, May 24).

While a student at Gorham he was very active in a natural history society in that town, which has long been forgotten. In 1839 and 1840 he was Secretary of the Bangor Natural History Society, which many years ago shared the fate of that at Gorham. Yet the Bangor

a little further to the south than the route taken by Dr. Young, thus avoiding the ascent of Mount Russell. Reaching the summit, they became enveloped in clouds with rain and were assailed by a heavy wind. They reached only the southern end of the North Mountain. Dr. Hale gathered about 20 species of plants in series of 20 each for Dr. Gray. (Boston Daily Advertiser Aug. 15, 1845; revised 1901, Appalachia IX (iii–iv) 277–289).

[1] Dr. George B. Emerson, born in Kennebunk, Maine, in his "Trees and Shrubs of Massachusetts" had mentioned a number of the rarer species found in York County. Dr. Young was familiar with Emerson's work and probably was inspired by it to make his prolonged "survey" in this region.

Society appears to have been the medium which held his attention and led up to the shaping of the Botanical Survey.

The duties of the secretary of the latter brought him into correspondence with Dr. Ezekiel Holmes,[1] who seems to have become his valued advisor.

Replying to a letter from Dr. Young of February 6, 1839, Dr. Holmes wrote as follows:

Augusta (H. R.) Feb. 14, 1839.
Mr. Aaron Young
Secretary of the Bangor Nat. History Society.
Dear Sir

Yours of the 6th., was duly received, informing me that I have been elected an Honorary member of your Society.

Allow me, Sir, through you to express my sense of gratitude to your Society for the honor conferred upon me by them. The study of Natural History is the learning the laws of nature as laid down by Omnipotence Himself & the application of the facts discovered by the scouts have contributed largely to the civilization of man & the amelioration of society.

You have begun well, let your labors be known to the world. Allow me to suggest that you lay out some ground work & by means of the press, let your light shine out among the people of the State. If you feel *modest* suppose you confine yourselves to the city of Bangor and vicinity & next summer publish a Flora of Bangor.

It is very probable that you will find nothing new—but what has been found and described many times before—What then? Would not a work emanating from your Society, containing accurate but familiar descriptions of the plants to be found at your doors, and around your fields & put into the hands of your children & young people stimulate them to the study of Botany much more than a large volume containing concise & technical descriptions of plants of North America? Perhaps I am intruding by offering suggestions unasked. Excuse me and accept my best wishes for the success of your Society.

Very respectfully yours,
E. Holmes.

Four years later, 1843, while domiciled in Bangor and a member of the firm of McRuer and Young, Druggists, Aaron ventured upon the publication, in the Bangor Daily Whig and Courier, of a work bearing the title suggested by Dr. Holmes.

The Flora of Bangor; a description of the plants of Bangor and vicinity, with their generic and specific characters, places of growth and time of flowering. By Aaron Young, Jr.

The copy seen had been clipped from the columns of the Whig and Courier and pasted on sheets of octavo size. Neither the sheets nor the species were numbered, hence it is not entirely certain that none

[1] Dr. Holmes was born in Kingston, Massachusetts, August 24, 1801. A biography, with portrait of Dr. Holmes, was published by Dr. N. T. True in the Tenth Annual Report of the Secretary of the Maine Board of Agriculture, 1865, 207–226.

have been lost, but starting with the Ranunculaceae and closing with the Equisetaceae it would seem to be complete as far as published.

Eighty-seven species are treated. The paper contains an introduction, exhorting the reader to the study of botany, and rather extended directions for the collection and preservation of specimens.

The author states, "It will not be presumed that I shall confine myself strictly to the environs of our City, but on the contrary shall open the whole field of Maine as far as my observations have extended and the assistance of others in increasing my *hortus siccus*."

As an example of the taxonomic treatment and geographical scope of the paper, we present his account of the three leaved cinquefoil, then considered rare outside of alpine regions, and unknown to the author from the vicinity of Bangor.

POTENTILLA TRIDENTATA *Ait. Mountain Cinquefoil.* This is an abundant plant on the plains of Brunswick, particularly in the College yard and I believe has not been found anywhere else[1] in our state, except on Mountain tracts. Stems three to six inches high, prostrate, irregular, crooked and somewhat woody at base; stipules subulate at top below the leaves, leaves ternate-palmate; leaflets obovate-wedge-form, leathery, three toothed at the summit, pubescent beneath. Flowers white, in a sort of corymb, loose few-flowered; petals, oblong-obovate, longer than the calyx. June and July.

The paper contains an extended and original account of the colony of *Rhododendron maximum* at Standish,[2] which by a slip of the pen is located at the northern rather than the southern end of Sebago Lake. The most important feature of the document is the report of the colony of *Kalmia latifolia* at Cherryfield[3] here brought to attention evidently for the first time.

The die had been cast, and Aaron submitted his "Specimen sheets" to his advisor, Dr. Holmes, who was hardly less ambitious than himself and fully as generous in respect to geographical limits. Dr. Holmes wrote very encouragingly in reply, and having been asked for suggestions gave the advice which seems to have been rather closely followed in carrying out the field work of the Botanical survey.

"Senate Chamber March 22, 1845.

A. Young, Esq.

Your letter of 25th., Feb. & the specimen sheet of "Plants of Bangor" have at length reached me. They were misdirected. I reside in Winthrop but am stopping this winter with the "servants" of the dear people.

[1] Cf. 1837, J. W. Bailey, Am. Journ. Sci., XXXII. p. 30. "Found it within a few yards of the ocean at the observatory in Portland."

[2] This station seems first to have been mentioned in print by Jacob Bigelow, 1820, Medical Botany, III, 402, 403. It had been brought to his attention by "Dr. Eaton."

[3] See 1913, RHODORA 15, 142; 1931, RHODORA 33, 198–199.

I am very happy to learn that you have spent so much time, so SUCCESSFULLY in the Botanical researches suggested and I am happy to receive an evidence of your industry in the specimen sheets forwarded.

You ask my advice in regard to the work. I hardly know what to say to you, I would however respectfully suggest that if you make up your mind to describe the plants of Maine it would be advisable to change the title to that of "Flora of Maine" and the Flora of Maine when completed may rightfully comprehend the plants of Canada and the Province of New Brunswick and Nova Scotia as well as the Alpine plants of New Hampshire.

If you could spend a summer or a portion of a summer in exploring the St. John River and its tributaries from mouth to source, you would find many specimens not found in your neighborhood and they would be a fair sample of the New Brunswick plants.

The White Hills run over into Maine and to my certain knowledge the spurs of these mountains in Maine produce all the plants found in New Hampshire, so you can avail yourself of all the descriptions of those plants which you can find.

You will then want to have an exploration of our sea coast and islands which would consume another, or what would be the same thing, the labor of some one during the summer. I do not know whether our coast has ever had a Botanical survey. William Allen, D.D. late President of Bowdoin College paid a good deal of attention to our marine plants near Brunswick. He now lives in North Hampton, Mass., and I presume will give you a list of what plants he has found there.

Prof. Keeley of Waterville College will give you a list of plants in his neighborhood which he has explored pretty well. Dr. Scammon of Hallowell will probably give you a list of plants found in his neighborhood.

Perhaps you will ask me why cannot you furnish me some list? Alas I have spent heretofore, much time studying the Natural History of Maine with the view of publishing a general work on the subject while at Gardiner Lyceum; the story needn't be told; but I will merely say that in trying to do my duty to the Institution I fell largely in debt and my cabinet (by the liberality of the Trustees) which cost me more than a thousand dollars and several years of the best part of my life, was wrested from me and what now remains is at the Lyceum yet.[1] Let it go, I had to look out for bread for myself and family and let the Science of Nat. Hist. of Maine take care of itself. Were it not for this I could assist you, as it is I can only wish you God speed and will endeavor to help you by any views or suggestions which may occur to me.

I like your plan of the work, would put in such short facts as regards the medicinal and common uses to which the plants are put.

Please command me in anything that I can serve you and may plenary success attend your labors.

Cordially yours, E. Holmes.

Aaron Young was now determined to produce a "Flora of Maine," an ambition which he had long cherished and worked for, though he had restricted the title of his first paper in deference to the advice of Ezekiel Holmes. It would also seem, from other correspondence that

[1] The building which had housed the Lyceum, with its contents, was destroyed by fire in 1870.

he had for some time looked with hope to an exploration of Mount Katahdin.

In business Dr. Young was unstable, a fact shown to be true by the frequent changes he is known to have made. Under these conditions, the matter of financing his botanical work was an obstacle to his ambitions.

In 1847 he appealed to the legislature for an appropriation for a Botanical Survey of the State. He was most fortunate in being on the most friendly terms with Elijah L. Hamlin and other influential members of the legislature.

Mr. Hamlin presented in the House the memorial and resolve asking for $600 for the purpose, though he realized, and informed Aaron that "this is not enough" but all that he believed it possible to secure at that time. He was keenly interested in the measure, and every week from the time of introduction of the resolve, May 23d., to that of its final passage by the Senate, June 25th., he wrote Aaron reporting the progress and the prospects of the document. The measure had been referred to a committee of 13 from the House and 5 from the Senate, and at the close of two sittings it was given a unanimous favorable report. It was approved by Governor Dana, July 3, 1847.

Though the appropriation was small, the requirements placed upon the appointee were not correspondingly stinted.

Acts and Resolves Twenty-seventh Legislature.
Chapter 11. Resolve authorizing a botanical survey of the State.

Resolved, That the Governor with the advice and consent of the council is hereby authorized to employ some suitable person to make a botanical survey of the State.

Resolved, That the person who shall be employed to make said survey shall deposit a complete suit of specimens of the flora of the State properly preserved and prepared, and suitably, labeled and arranged, and deposit the same in the public buildings, as the property of the state, and such person shall furnish such duplicates of said specimens as the governor and council may direct to be disposed of by them as they shall think proper.

Resolved, That the sum of six hundred dollars be appropriated from the treasury, subject to the discretion of the governor and council to be expended by them in defraying the expense of said survey, upon such terms and conditions as they may think best, *provided,* that said survey can be finished for said sum.

(Approved July 3, 1847)

Mr. Hamlin had approached Dr. Ezekiel Holmes, among others, on the subject of the survey, before he had decided that there was a fair prospect for the passage of the resolve, and had found Dr. Holmes in its favor.

It would appear that Aaron had looked upon Dr. Holmes as a logical, or possible competitor for the appointment of State Botanist. This is shown by the following letter, as well as the fact that a real competitor lay in the offing.

Winthrop July 8, 1847.

Dr. Young.

My Dear Sir—

While at Augusta yesterday I recd. your letter of July 2d. & after I returned this morning I recd. yours of June 27 to the care of friend Hamlin. So the last was first this time. I am not a competitor against you & was greatly surprised that any body came forward to trip up your heels—but such is the way of the world, there is always somebody ready to plunge into the pool of public pap (if it is ever so little a one) after it has been stirred by the political *angels*. Never mind. I hope your bill succeeded in obtaining the mission & that you will find the top rock of Katahdin, coast down the St. John from source to mouth, and home by way of the islands & by the way stop right here. While I think of it & put down upon your list of plants *Subularia Aquatica*, Mr. Nuttall[1] gave me a specimen of this plant 24 years ago, which he had found in a pond in Waterford, Ox^{d} Co., in this State & told me that he had never seen it before except in some of the small lakes in the north of Europe.

I will do what I can for you in obtaining the appointment.

In much haste, yours &c.
Ezekiel Holmes.

Before the ink of the official signature was dry, Dr. George C. Swallow, then a teacher at Brunswick, had appeared in the halls of the legislature as a candidate for the appointment. This incident seems to have caused some excitement among the friends of Aaron Young. Mr. Hamlin was absent, but other loyal friends were present and advised Aaron to act promptly.

Augusta July 3^{d} 1847.

Dear Sir

Mr. Hamlin has no doubt informed you of the success of your petition by the passage of the resolve reported by the Committee.

By that resolve you are assured the Gov. & Council have authority to appoint whom they please to make the survey &c., as therein provided.

[1] In 1800 a post office was established at Waterford which became a mail distributing station, reached by a "post rider" on horseback from Portland; his route passed through Standish and Bridgton. He returned through Norway, Paris, Hebron, Poland, New Gloucester and Gray. In 1820 a four-horse coach or stage was put on the route. (Lapham. Hist. Paris. 266).

Another road, from the "White Mountains," through Conway entered Maine at Fryeburg and continued to Portland through Standish.

A letter from L. Willis to Mr. Elijah L. Hamlin, July 15, 1824, stated that Mr. Nuttall of Cambridge would visit Paris in a few weeks for the purpose of viewing Mount Mica where tourmaline had been discovered four years earlier. John Pedrick of Salem wrote Mr. Hamlin August 10, 1824, that Professor Nuttall had started for Franconia and Paris. (Hist Mount Mica, 19.)

It would seem that Mr. Nuttall had taken passage from Franconia to Standish, thence the stage to Waterford, remaining over night, which allowed time for exploration of the pond where he found *Subularia* before continuing on his journey to Paris.

I find a gentleman has arrived here today from *Brunswick* by the name of *Swallow*, who is making interest for the appointment, by getting recommendations from members to the Governor. He has recommendations from the President and Faculty of Bowdoin College and others.

What his claims are I know not save by his certificates. But as the resolve was passed on your petition, I thought it right you should know what was going on (if you haven't already been appraised of it) so that you might take measures to defeat the opposition of Mr. Swallow; and as Mr. Hamlin has gone to Paris to be absent till the middle of next week, I have taken this opportunity to give you the information above. I supposed it was your intention to visit Augusta *soon*. You will now perceive the propriety of not delaying it any longer.

You will deem it best, no doubt, to bring with you all the testimonials you can get of your qualifications for the appointment.

Mrs. Appleton & Elizabeth are here and send their best regards to Mrs. Young and yourself.

Very truly yrs
N. D. Appleton[1]

Dr. A. Young Junr

This incident probably delayed the appointment of the State Botanist for several weeks. Dr. Young finally received the commission but not until the summer was well advanced.

The first steps for the execution of the survey followed quickly and on August 18, 1847, at nine A. M., a party consisting of seven persons left Bangor for an exploration of Mount Katahdin.

The party consisted of Dr. Aaron Young, Jr., in charge, aged 28 years; Dr. George Thurber of Providence, R. I., later noted as a botanist and horticultural editor, aged 26 years; Rev. Ariel Parrish Chute, a clergyman of Harrison, Maine, aged 38 years; Mr. J. K. Laski, later known as Dr. John De Laski, and a writer on the Glaciology of Penobscot Bay, then probably of Bangor, aged 32 years; John Emerson of Glenburn, Maine, a young man, George Emerson of Bangor, a youth, and James Cowan of Bangor, guide.

Dr. Young in his letter to the governor submitting his report on the survey says of the party, "In my exploration of Katahdin I was accompanied by Mr. George Thurber of Rhode Island and Messrs. Chute and Emerson of this State, gentlemen well skilled in botany, who rendered me very efficient service in my labors. Other gentlemen also volunteered their services, to whom I am indebted for the alacrity with which they entered upon their tasks."

Dr. Thurber in his private diary gives this view of the party.

[1] Nathan Dane Appleton, born in Ipswich, Mass., May 20, 1794, graduated from Bowdoin College, 1813. Practiced law at Standish, Maine from 1818 to 1820; and at Alfred from 1820 to 1861. State representative 1829, also 1847–1848. State Senator 1830. Attorney General of Maine 1857 to 1859. Died at Alfred, November 12, 1861

Dr. Y., I had never met before. He is very zealous in botany but lacks discretion, and was not entirely the man to have charge of such an expedition. Mr. Chute I was pleased to meet, a good naturalist and upon the whole an amiable man. Mr. Laski, who is a man of some literary pretensions, was rather too much out of his element to appear well, still he treated me with the utmost consideration. Mr. Cowan, our guide, a good-hearted rough fellow I got much attached to. He showed me every possible kindness. John Emerson, poor deaf and mute fellow, filled with the love of nature but every outlet to his joy closed, save his bright speaking eye, kind, patient, enduring John, I shall not soon forget you. And George Emerson, too, my little chum who always shared my blanket and my cup, who was always trying to do some kind thing, dear friend, I hope once again to see your kind smile.

The itinerary of the Katahdin expedition has been well told in the account published by Mr. Laski in the Bangor Courier early in September 1847, which has been reprinted in the Maine Naturalist, (1927, VII, 38–62), and by Dr. Thurber in the Providence Journal late in September 1847, also reprinted in the Maine Naturalist, (1926, VI, 134–151).

This expedition consumed two weeks, the party reaching Bangor on its return September first. Collecting was done along the way and on the mountain, which was explored from Mount Russell, its north-eastern spur, to Monument Peak.

Upon this peak Dr. Young bestowed the name of Pomola, but through the obscurity of his medium of publication his name was lost to view, and fourteen years later Dr. Charles H. Hitchcock bestowed the same name upon the eastern peak, which still bears that name.[1]

For the North Mountain (so called), he used the name of Camel's Back, and he named the body of water now known as Chimney Pond, Norris Lake, in appreciation of the labors of Joseph Norris[2] who ran the monument line from the eastern boundary of the State to Mount Katahdin in 1825, and was probably the first to describe this pond.

The party collected a large number of the more conspicuous plants of the mountain, and many of these found resting places in the older

[1] Hitchcock, First Ann. Rept. Scient. Surv., in Sixth Ann. Rept. Sec. Maine Bd. Agric. 398. In his second annual report, 1862, he again refers to the subject expressing the erroneous belief that "by a strange coincidence the name Pomola was applied many years ago by Mr. Young, a botanist, to the same peak to which we thought it appropriate last year" (348).

[2] In 1825 Joseph C. Norris and son entered upon the task of surveying a base line for township surveys, due west across the State, from the head of the East Branch of the St. Croix River also known as Monument Brook, in the town of Amity. This line which crossed the northern end of Katahdin is commonly known as the "Monument Line."

Mr. Norris traversed the mountain for nearly its entire length. His journal was evidently carefully studied by Aaron Young, in the Land Agent's office. Norris's description of this pond was published by M. H. Avery, 1928, Appalachia XXI, 39.

herbaria of the eastern states, and many are mentioned by Dr. Young in his report. Dr. M. L. Fernald has summarized the known results of the expedition as follows. "Though they brought back the first representative collection of Katahdin plants, they apparently got none of the rarer species and the data upon their labels are unfortunately incomplete."[1]

The second step towards the execution of the survey was taken September 28, when Dr. Young reached Castine and employed "Mr. Bridges" to assist him for several days.

Dr. Young had a wide circle of correspondents among the leading botanists of the period, among them Prof. William H. Harvey, the eminent Irish algologist. Prof. Harvey had encouraged him to dredge on the Maine coast for algae, believing from the rocky indented nature of the shores with their deep reaches, that it would prove one of the most fruitful regions on our Atlantic coast for these plants.

Aided by Mr. Bridges, he spent most of the time at Castine in dredging in water of varied depths. October 5 he embarked on the Revenue Cutter "Veto," Lieut. S. C. Foss commander, for a short cruise among the islands of East Penobscot and Jericho Bays. On the date mentioned they harbored in the lee of Big Deer Island, where Aaron again used the dredge. From this berth they sailed to Burnt Coat, now called Swan's Island, where they harbored one night. The dredge was used here, both in the harbor and in deeper water outside.

From Burnt Coat they sailed to Isle Au Haut Thoroughfare October 7, and Dr. Young, Lieut. Foss and the Pilot, Mr. Eaton, landed on Isle Au Haut and ascended "the mountain"; Aaron noticed alders, "low alder, (*alnus crispa*) not over two or three feet high, apparently distinct from the two species common in our low lands;" "*Oakesia*" [= *Corema*] "*Conradii, Kalmia latifolia*"[2] and a few common plants.

Returning that night to the Northwest Harbor of Great Deer Island, on the following morning they visited the serpentine quarry on the island, then giving promise of commercial importance. Aaron learned that on frequent occasion fires had raged, destroying the yellow birch woods on the island, formerly a valuable source of fuel to the settlers.

[1] 1901, Fernald, RHODORA, 3 166.

[2] Mr. N. T. Kidder, authority on the flora of Isle Au Haut, informs the writer, that this plant is not now known to occur on the island and raises the pertinent question of a possible mistake in identification of the species. Dr. Young seems to have been acquainted with the three species of *Kalmia* found in the State, having described them all in the Flora of Bangor in 1843. Considering the violent admiration given this showy plant both for floral and evergreen decorations, wherever it occurs in isolated colonies, it seems possible that a small colony existing in 1847 may have been extirpated.

He remarked that "*Ulmus fulva*" was a native tree of the island "but only two or three trees remain standing" and these cruelly stripped of their bark.

From this place he returned to Bangor and prepared for the final stage of his survey, an exploration of the hard-wood forests of York County. He states that he devoted three weeks to this section, and his diary closes on October 27, with an excursion to Kennebunk Beach for marine algae, which were washed ashore there in large quantities.

In February, 1848, he filed the report of his survey with the governor. This is largely in the nature of a diary of proceedings, divided by a series of chapters or headings, which show what he tried to accomplish. It was submitted as a preliminary report, with the evident hope that the survey would be continued by the next legislature. That body was unwilling or unable to make further appropriations for the purpose, and some of the legislators expressed disappointment at not having received an illustrated handbook of the flora of the state, as the result of the ten weeks' work by the State Botanist, so the matter was allowed to terminate.

Dr. Holmes, editor of the Maine Farmer, a weekly newspaper, appears once more upon the scene, now to rescue from complete oblivion the "Report of the Botanical Survey." This he published in his paper under the general title of "Dr. Young's Report." It appeared in eight instalments from March 16 to May 25, 1848; the eight issues bear the following sub-titles and dates of publication.

March 16: [Letter of Transmittal]; Botanical Report of Mt. Katahdin.
April 13: Botany of Mt. Katahdin (concluded).
20: Brief Account of Mt. Katahdin.
27: Exploration of the Coast and Islands.
May 4: Forests of York County: Species of Oak.
11: Oak Planting.
18: Continued.
25: Concluded.

No instalment appeared between March 16 and April 13; both of these issues are devoted to the Botany of Mount Katahdin, wherein are mentioned forty-two alpine species, with others observed between the base of the mountain and Hunt's Farm on the East Branch of the Penobscot River. The fact that the white pine had been nearly all stripped off along the Wissataquoik previous to that time is noteworthy.

In his "Brief Account of Mt. Katahdin," April 20, Dr. Young reviews the principal facts concerning the ascents of Turner, 1804,

Bailey 1836, and Jackson, 1838, placing all possible emphasis on the scanty botanical notes contained in their published accounts, and gives a geographical description of the mountain, with reference to its satellites to the north and west. His description of the summit of the mountain from Mount Russell to Monument Peak is evidently the first to appear in print, excepting the more scattered notes of his associates, Laski and Thurber, published a few months earlier. In addition to the nomenclature proposed by Dr. Young, noted above, he coined the term "saxetum" for the rocky slopes of the peaks, a term for which the "alpine fell field"[1] of recent application seems more or less synonymous.

April 27, "The Coast and Islands," has been sufficiently noticed.
May 4, "Forests of York County, Species of Oaks,"

enumerates eight species, which are distinguished as *Quercus alba, Q. bicolor, Q. montana, Q. ilicifolia, Q. rubra, Q. borealis, Q. coccinea, Q. tinctoria,* (= *velutina*), and *Q. chinquapina* (*prinoides*). The last from the foliage was at first considered to be young plants of *Quercus montana,* but finding it with mature acorns, combined with low shrubby habit, Dr. Young finally identified it as above. This he states, he found mingled with the bear oak "on arid sandy plains of Alfred." This species has not been found in Maine in recent years.

That Aaron Young had been a frequent visitor in Alfred previous to the time of his survey is indicated by a note in his "Diarium" appearing in the "Touchstone," October 11, 1854, when on passing through that town in his cart, "The Good Samaritan" he observed, "We were married here and never regretted it."

May 18. Though this instalment bears no title suggestive of its contents, the journal of field work is resumed giving accounts of the Chestnut, Butternut, Shagbark, the Hazels, *Rhododendron maximum* and *Kalmia latifolia,* both of which the author found in York County, (and again references are made to the occurrence of the latter at Cherryfield and at Isle Au Haut); of the Sassafras, Fever Bush (*Benzoin*) and *Stellaria aquatica* (= *S. uliginosa*) which Aaron was asked to examine at "a vale of springs" in Alfred where the plant grew with such luxuriance that it often choked the outlet of the stream from the springs and "defied extirpation."

May 25. Concluded. (excursion to Kennebunk Beach.)

In the report of this survey, as printed in the Maine Farmer, there are mentioned a total of ninety-seven plants, including three algae,

[1] 1919: Harshberger, Geogr. Rev. 7: 233.

two lichens and one moss. Young made no attempt to include the result of his dredging operations in the report, or to enumerate the non-vascular Cryptogams which he evidently collected on or near Katahdin. The chief emphasis of the report is placed on the survey of Mount Katahdin. Here he enumerates the vascular cryptogams, Coniferales, Graminales, Liliales, some other prominent herbaceous groups, and the woody plants of the mountains. On the coast he touched either upon the most conspicuous or the rarer species, few in number, and in York County almost entirely upon the trees and shrubs.

By March, 1848, he had prepared the first volume of a proposed Exsiccatae of the "Flora of Maine." One or more copies of this was exhibited at various cities, Portland, Boston and New York, and a copy seems to have been presented to Hon. Nathan Dane Appleton, yet no copy in the original[1] condition seems to be known in existence today.

The following abstract by Dr. Asa Gray[2] gives the most complete description of the title and nature of the work which we have discovered.

A Flora of Maine, illustrated with specimens from Nature, arranged according to the Natural System, and containing Descriptions of all the known Indigenous Plants Growing in the State, etc. by Aaron Young, Jr. Bangor, 1848. Vol. I.

We have seen a specimen volume of this work, which Mr. Young who was recently appointed to make a botanical survey of the State of Maine, is engaged in publishing, "in so unique a manner." It is a large folio volume, very handsomely bound in cloth, and containing fair specimens of about forty plants of the state, each fastened to a sheet of thick paper, protected by a fly leaf, and accompanied by another leaf containing the name of the natural family to which the species belongs, its generic, specific, and popular names, a specific character, place of growth, time of flowering, and some descriptive or popular remarks. Mr. Young proposes to publish all the plants of his state in this manner, "in about twenty volumes" (which however, will not be sufficient for the purpose), and offers the whole to subscribers for $100, or the volumes "of from five to ten decades each" at six dollars. No doubt there will be a ready demand for as many copies as he can prepare, "of the present magnificent size" and style; but how they can be afforded at this price is entirely beyond our comprehension. That it is not done at the expense of the State, but at the author's proper expense, is evident from the fact, that, the appropriation for conducting the botanical survey appears to be only two hundred dollars per annum for three years.

A. Gr.

[1] Dr. M. L. Fernald informs the writer that there is a set in the Gray Herbarium which has been taken apart and the specimens distributed according to the classification of the Herbarium.

[2] 1848. Am. Journ. Sci. 2 s. V. 453.

He forwarded a copy to New York for the especial purpose of submitting it to Dr. John Torrey, as shown by the following letters.

Princeton March 17th 1848.
Dear Sir:

Your letter of February 25th reached me the first of March. As it was not mailed till the 26th inst., there was not time for an answer to reach you by the first of this month, (the time you wished me to reply) even had the letter come by express.

When it came however, I was busily engaged in my Chemical lectures and laboratory duties—besides examining students every evening.

I was also writing during the half hours that could be snatched from other duties, a Botanical Report to accompany Major Emory's narrative of the expedition across the Continent in which he acted as Top. Engineer. You see then how nearly impossible it was that I could write to you.

The illustrated Flora of Maine which you have undertaken will be a work of great labor but (if properly executed which I have no doubt will be the case) the value of it will repay all cost. In many respects such a work though the number of copies is very limited will do more good than even a printed volume of Descriptive Botany for it will at once settle the nomenclature of any plant of your State that it includes. If copies were deposited in the principal towns of Maine where they could be referred to by persons who are studying native plants there never could be any difficulty with the Botanical and popular names of your plants. The price seems to be far too little for the work even if the style of it is of the plainest kind, but I suppose you can do such things cheaper in Maine than they can be done in New York. If you have an opportunity of sending a volume to New York and will direct it to be left at Dr. James Chelton's in Chambers St., I will examine it and report if you please to the Governor.

Yours truly
John Torrey.

Princeton New Jersey March 31st 1848.
Dear Sir.

Your favor of the 22nd is received and yesterday I had the pleasure of examining your beautiful volume, sent to me through Mr. Chelton.

I hardly see how it is possible for you to get out the work at so low a price. If you can have the actual cost it will be all you can expect. Pray what is the cost of binding such a volume in Maine, supposing 100 copies be done at once?

I have admired your paper as just the thing for an herbarium. It is difficult for me to get any here. I need some now for my own herb. The size of my paper is only (when folded) 15 x 11 inches.

Will you have the goodness to enquire, whether any of the paper manufacturers around you have a white that will cut, without much waste of that size. The color, thickness & stock as much like yours as may be. Or if they have it not, how small a quantity of it they will make to order and the price. It ought to weigh about 45 or 50 lbs., to the ream.

The State of New Jersey is a poor place for science. I doubt much if any subscriber could be got in it for your work, or even for one much nearer home. In our town (I mean Princeton although I don't consider myself a Jerseyman) there is but one person who has a taste for botany besides myself. It is probable that if your specimen volume were left at some

literary emporium in New York some person would see it who would like to secure sets of the work. If you are willing to trust it I will have it deposited at Wiley's (of the late firm of Wiley and Putnam) and instruct a neighbor of mine who is in the store to show it where there may be a chance of its being appreciated.

I enclose a note to Governor Dana which may meet your views.

Yours truly

John Torrey.

You can read the letter to the Governor then seal and deliver it. Did you notice a little error in your title page, synonymon for synonyms?

With the termination of the Botanical Survey, which he plainly aspired to finish, and the lack of subscribers to the Flora of Maine, Dr. Young appears to have abandoned the field of botany. He was not embittered by the collapse of his hopes, but his active mind turned to other channels of thought, and other experiments at making a living in which the popular response was more in the nature of "The show which wayside folk admire."

He moved to Lewiston and again engaged in the drug business. Here he began the publication of several newspapers: "The Pansophist" 1852, which continued a year or less, followed by the "Touchstone" 1853 and 1854; the same year, 1854, the Farmer and Mechanic, of short life, which seems to have closed with six numbers.[1]

In the Touchstone he conducted a department called "Diarium," a section teeming with short notes, many of them now of historical interest. In the "Diarium" of May 18, 1854, he says "We don't print a paper for any other purpose but to let our minds have a vent." This may be regarded as a fair commentary on his life motives, the finding of an outlet for continual action for action's sake.

He soon offered his drug interest for sale, and appeared at Farmington, where he edited the "The Franklin Journal of Aural Surgery and Rational Medicine," 1859, another journal of short life. In the first issue, of January 15, 1859, there appears under his authorship a very fine obituary of Professor Parker Cleaveland.

Before leaving Lewiston he abandoned the confinement of the "Store" and launched upon the road in a spectacular peddlar's cart, decorated by a Good Samaritan in the act of healing, in which he travelled all over the southwestern section of the State selling "Young's Cathalicon," a cough syrup reputed a great remedy for human ills. He interested himself in civic matters, public health, the cause of the striking mill-girls whom he believed to be justly aggrieved, and the

[1] Files of the several papers published by Dr. Young have been obtained by Dr. James A. Spalding and deposited in Bowdoin College Library

cause of abolition. Indeed, like his brother Joshua Young, D.D. (ostracised from his church at Burlington, Vermont, for officiating at John Brown's funeral[1]), Aaron became too vociferous on the subject of abolition for his own welfare, even in Maine, and found it advantageous to move to New Brunswick.

With the outbreak of the civil war, his friend Hannibal Hamlin secured for him a consulate at Rio Grande do Sul, Brazil, which he held under Presidents Lincoln, Johnson and Grant. There Aaron Young found a large field of usefulness suited to his temperament, spending his time and even money in attending the suffering and needs of the hosts of refugees from the Southern States, in attempting to induce development of the natural resources of the country, in laboring for the improvement of the river and harbor at that port, and collecting a wealth of material for the Smithsonian Institution.[2]

Society of Natural History,
Portland, Maine.

A PRE-KANSAN RECORD OF PICEA CANADENSIS FROM MISSOURI[3]

Ethel B. Hansen

Plate 323

A piece of wood obtained from a coal mine in Macon County, Missouri, has added a new species to the interglacial flora of that state.

Preglacial erosion, especially in the territory bordering the Middle Fork in Macon County, Missouri, cut down in places sufficiently far to remove even the Bevier bed of coal. Clays, containing pebbles and overlain by drift varying in thickness up to 100 feet, now occupy the coal horizons (6). A diagram of shaft No. 24 of the Central Coal and Coke Company in Macon County is shown in Fig. 1. The strata, including the Bevier coal seam, have been cut through by preglacial erosion to a hard limestone below. At a point marked "X" the wood under consideration was found. This wood covered by Kansan till and occupying the place where the Bevier seam formerly was, is believed to be pre-Kansan or Aftonian in age.

[1] 1903: Crawford, Romance of Old New England Churches, Boston, L. C. Bodge & Co. p. 322.

[2] See Commercial Relations of the U. S. for 1864, 1866 and 1871.

[3] Papers from the Department of Botany and Herbarium of the University of Michigan No. 425.

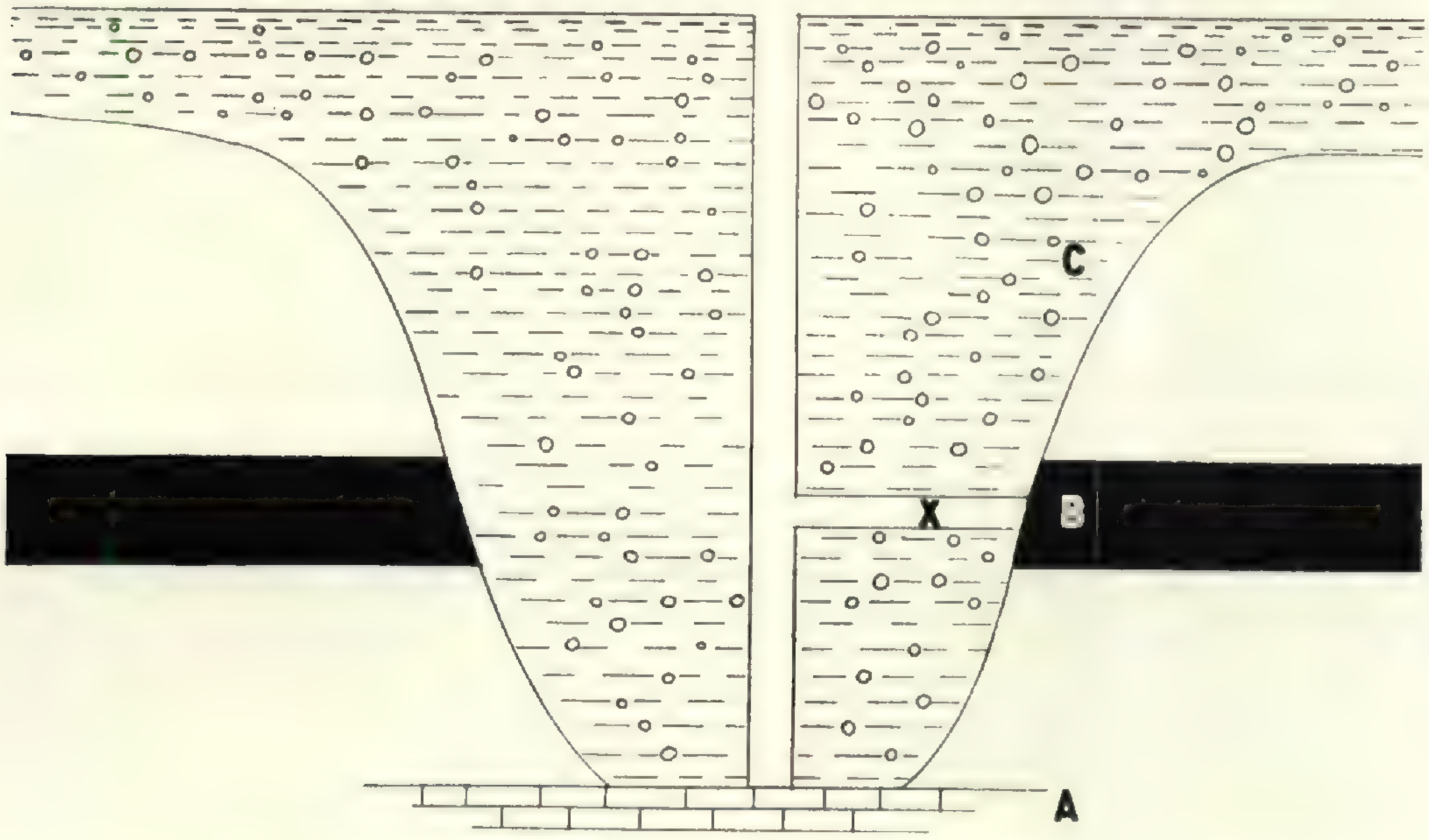

FIG. 1. Shaft No. 24, Central Coal & Coke Co.

The correct identification of fossil wood is attended with much difficulty due to the fact that not only color, odor, and the bark are usually missing but the cells are often badly crushed and fungal hyphae, spores, and mineral deposits obscure diagnostic features. After a careful microscopic examination of the wood (PLATE I), and comparison with known species, it was identified as *Picea canadensis* (Mill.) BSP. This species, has been found previously in the Pleistocene at Scarborough Heights, Ontario, Canada (9), and at Bloomington, Illinois (5).

In Missouri, Aftonian deposits have furnished fresh-water shells and the remains of mammals but the data concerning plant fossils have been very deficient. Broadhead (3) as early as 1870 reported sticks of wood found at a depth of 75 feet, and part of a grape vine at 40 feet in northern Missouri.

The same author (4) reported wood found in Daviess County; a grape vine and elm stick at a depth of 35 feet, a walnut log at a depth of 40 feet, and a pine log 6 feet in diameter at 70 feet. McGee (8) mentioned a forest bed 9 feet in thickness and 120 feet beneath the surface of the ground in Harrison County.

Baker (2) after making a careful study of the flora and fauna of the Aftonian period believes that there is evidence for a succession of two climates, (a) a warm, moist, temperate climate which favored luxuriant forests and such animals as the horse, elephant, and peccary and (b) a cold temperate climate in which a boreal flora flourished. Low-

lands and uplands, as today, furnished different habitats for plants and animals.

It is indeed fortunate that a single specimen of wood found in a coal mine has proved to be a species of definite climatic significance. The trees, shrubs, and herbs which were associated with *Picea canadensis* in making up the flora of the pre-Kansan period are as yet unknown. However, it is hoped that an opportunity may be presented for systematic collecting by a trained botanist at the site of an excavation or the sinking of a mine shaft which exposes a forest bed or fossil material. A collection made in such an exposure may give the investigator access to a whole florula.

Since *Picea canadensis* is limited in its southern extent by dryness and heat, it probably grew only during the period of boreal climate in northern Missouri. Its range extending as it does from Labrador northwestward nearly to the Arctic Sea is distinctly boreal. Its southern limits are southern Maine, northern New Hampshire, New York, shores of Saginaw Bay in Michigan, northern Wisconsin, and Minnesota (10).

It is interesting to note that the seedlings of *Picea canadensis* are light-tolerant and therefore pioneers in contrast to the shade-tolerant seedlings of climax forest trees (7). This spruce, limited in its southern extension by temperature, may have been an outlier on the frontier of the forest before the invading Kansan ice sheet.

SUMMARY

Picea canadensis (Mill.) BSP. has been found in northern Missouri and is considered to be pre-Kansan or Aftonian in age.

The presence of this species definitely indicates a boreal climate during part of the Aftonian interglacial period.

Acknowledgements are due to Wm. Harkes, General Superintendent of the Central Coal and Coke Company, Kansas City, Missouri, for sending the specimen of wood with data and a sketch of their mine shaft, and also to Dr. Frank Leverett, Dr. H. H. Buehler, and Professor E. B. Branson for their opinions as to the age of the wood.

UNIVERSITY OF MICHIGAN.

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EXPLANATION OF PLATE 323

Transverse section of *Picea canadensis* found in coal mine in Macon County, Missouri, × 150.

BETTER HERBARIUM SPECIMENS.—Prof. J. Franklin Collins' article[1] under this title, advocating the use of sheets of sponge rubber as cushions in the plant press to equalize pressure and secure well-dried leaves and flowers borne on thick branches and stems or in close proximity to large fruits, calls to mind a very simple practice I have followed for several years which seems to offer certain advantages over the use of sponge rubber. It consists merely in inserting in each folder of such specimens, as the plants are put into the press, sheets of newspaper folded into appropriate shape and thickness and placed on the parts of the specimen that require special attention. These folded pieces of paper do not need even to approximate in thickness the thickness of the fruit or branch next which they are placed; two or three folds of paper are almost always sufficient, the flexibility of the drier sufficing to equalize the pressure; and they do not interfere at all with the proper drying of the specimen. They also assist in drying without contact, discoloration or deformation large folded fern fronds or leaves which overlap when the specimen is placed in its folder. A single piece or sheet of newspaper inside the folder is also helpful in keeping smooth compound leaves or delicate ones which tend to shrivel or inroll on the edges in drying. The principal advantages of this method are its entire freedom from expense and its greater adaptability to the requirements of individual specimens.—S. F. BLAKE, Bureau of Plant Industry, Washington, D. C.

[1] RHODORA **34:** 247–249. 1932.

A POST-WISCONSIN RECORD OF FRAXINUS NIGRA[1]

Gladys F. West

Plate 324

This paper adds *Fraxinus nigra* Marsh. to the immediately post glacial fossil flora of New York.

The specimen under consideration was collected by Dr. Frank Leverett in Oak Orchard Swamp, Orleans County, New York, in 1893. It represents a piece of a log which was found buried under about three feet of muck. A number of other logs were found in the same place but, since they all appeared to be alike, a sample was taken from only one. The swamp lies in low places between gravelly ridges and knolls and rests upon Wisconsin till (5).

The development of the swamp deposit began at the time of the draining of Glacial Lake Lundy (Glacial Lake Dana, 3), which resulted in the inauguration of Glacial Lake Iroquois in the Ontario basin, and the establishment of Lake Erie (6).

A remnant of the Lake Lundy waters remained for a long time in the Tonawanda Creek basin in northwestern New York which became Lake Tonawanda. It was a long, narrow, shallow lake which extended from the western side of Niagara Falls, eastward through Niagara and Orleans counties for a distance of about fifty miles. The floor of the eastern end of old Lake Tonawanda in Orleans County is now Oak Orchard Swamp (4, pp. 136–144). The fossil logs can reasonably be said to have grown sometime during the life of Glacial Lake Iroquois. They represent the remains of trees which probably grew along the margin of Lake Tonawanda and either fell in or were washed in at the time of a flood. Later, changing drainage conditions caused the disappearance of the waters of this lake and the development of a swamp in its eastern end, which is now occupied by a dense growth of tamarack.

The wood, although soft and very light in weight, was found to be in an excellent state of preservation. After a careful comparison of the fossil wood with wood of all the American species of the genus, and reference to published descriptions (8), it has been identified as *Fraxinus nigra* Marsh., black ash (Pl. 0, figs. 1–4).

Only a few instances of the occurrence of ash have been reported in

[1] Papers from the Department of Botany and Herbarium of the University of Michigan No. 432.

the Pleistocene of this country. Fossil leaves of black ash have been reported by Penhallow (7) in the interglacial deposits of the Don Valley in Ontario.

The present range of black ash, according to Sargent (9), is from southern Newfoundland and the northern shores of the Gulf of St. Lawrence westward to Lake Winnipeg in Canada, and southward to New Castle County in Delaware, the mountains of West Virginia; westward to Knox County in southwestern Indiana where he considered its presence doubtful now; central Iowa, central Missouri and northwestern Arkansas. According to Deam (2), however, black ash occurs locally throughout nearly all of Indiana and in the southern part it is found sparingly in cypress swamps. In New York it is found in the lower regions in wet woods on bottomlands or along sluggish streams; at higher altitudes it grows along cold mountain streams and in deep, poorly drained swamps (1).

Little climatic significance can be attached to the presence of black ash in this particular instance except to say that the climate was probably similar to that of its northernmost limits today or, perhaps, even cooler due to the close proximity of the ice front. In the early stages of Lakes Iroquois and Tonawanda, the ice front probably stood a little north of the Carlton moraine in New York (4, pp. 134; 136), whence it gradually retreated northeastward out of the Ontario basin (6, Pl. 21), until by the close of Iroquois time it spanned the St. Lawrence Valley at a point below Kingston, Ontario (4, p. 144).

It is quite true that a great deal of climatic significance cannot always be attached to the presence of a single species, but the assembling of scattered records of the occurrence of only one or a few fossils may make possible the reconstruction of past floras of certain areas and the determination of the dominant components of those floras, from which certain conclusions may be drawn as to the climatic conditions which prevailed.

Summary

Wood identified as *Fraxinus nigra* Marsh., black ash, has been found in New York in a post-Wisconsin deposit which dates to a period after the inauguration of Glacial Lakes Iroquois and Tonawanda.

I wish to thank Dr. Frank Leverett for the fossil specimen and the data concerning it, and Dr. H. P. Brown of the New York State College of Forestry for woods of Fraxinus.

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Explanation of Plate 324

Fig. 1. Fraxinus nigra. Transverse section × 45, showing arrangement and distribution of vessels in early and late wood, narrow rays and terminal wood parenchyma.

Fig. 2. Fraxinus nigra. Radial section × 100, showing margin of a growth ring, wood fibers, vessel segments, terminal pore in a late vessel, vasicentric and terminal wood parenchyma.

Fig. 3. Fraxinus nigra. Tangential section × 100, showing vessel segments, wood fibers, vasicentric wood parenchyma, and distribution of rays in late wood.

Fig. 4. Fraxinus nigra. Tangential section × 200, showing pitted vessel segments of early wood.

NOTES ON THE DESMID FLORA OF NEW ENGLAND I.

The Genus Euastrum in Massachusetts[1]

Gerald W. Prescott

Plate 325

The genus *Euastrum* is a very interesting one for study, presenting as it does a number of taxonomic problems and a great variety of beautiful cells. The wall-markings in species of this genus, often very complex and elaborate, are helpful for identification purposes but to this end there is demanded critical discrimination on the part of the student. Because of the fact that these markings are easily obscured by density of cell-content, they are frequently overlooked. The failure to give sufficient attention to these often specific wall-characters leads to erroneous determinations, inadequate descriptions and, too

[1] Printed with aid to Rhodora from the National Academy of Sciences.

often, to incomplete and inaccurate figurings of these plants in literature. Hence, published figures, rather than being of assistance, are often misleading for purposes of identification, particularly to the beginning student. When an inaccurately executed published drawing is compared with the figure of the type or with a series of apparently faithful drawings the question naturally arises as to whether or not the worker had seen the form indicated or some other similar species.

It is the opinion of the author that one of the characteristics of the *Euastrum* cell has not received proper attention in both description of species and in drawings. This is the mucilage pore. The number and position of these pores are apparently specific and may be of assistance in making determinations. Too frequently the presence or absence of these pores is disregarded and, if present in the cell, are seldom shown in drawings.

It is the purpose of this paper to present certain notes and drawings for species of *Euastrum* in New England, which are new to the region or which, according to the writer's opinion, have been inadequately figured. Also plants are figured here which, so far as known, have never been illustrated in American literature, although they may have been reported and figured for this country in foreign journals.

The genus is well represented in New England habitats, there being some eighty species of a total of approximately one hundred forty varieties and species now known for North America. Our knowledge of the desmid flora of the region is largely the result of the works of Cushman (4–15), Harvey (17), (18), (19), Johnson (21), (22), W. and G. S. West (28–34), Hylander (20), and Wolle (35).

It is to be regretted that Cushman did not treat the genus *Euastrum* synoptically as he did some of the other desmid genera. The desmid literature is so very much scattered in this country (as in others, unfortunately) and the group so huge that the student of these plants must work under great handicaps. The possibility of having a monograph for this country similar to the work of the Wests in Great Britain is an achievement to be looked forward to. Such a monograph would of course be highly desirable because of the fact that the British Monograph is rapidly becoming insufficient, helpful and necessary as it is. It would seem that if such a work is ever to be accomplished in this country it must be done by contributions in the nature of generic monographs or synopses from various individuals. The lifetime of a single worker is scarcely long enough to permit the monographing of the entire group. Certainly Cushman made a start

in the direction of preparing synopses of the genera, at least for a restricted region.

The species dealt with in this paper are from collections made by the author on Cape Cod and adjacent islands during the summers of 1932 and 1933. From time to time it is hoped that he can add to knowledge of the algal flora for this very rich desmid region.

Euastrum Ehrenberg, 1832

Euastrum Didelta (Turp.) Ralfs. West and West, British Desmidiaceae II: 15, Pl. 35, f. 3–7.—Width 72.5 μ; length 130.0 μ. Pl. 325, f. 14.—Swamp near Falmouth.

This very common and widely distributed species has been adequately figured by Smith (26), Pl. 56, f. 2, except that the rather coarsely punctated character of the wall, an outstanding feature of the plant, is not shown. Other figures in American literature do not show the three large tubercles across the base of the semicell, the two just above the central tubercle with the mucilage pore between them, and the punctate wall.

Euastrum evolutum (Nordst.) W. and G. S. West var. Glaziovii (Boerg.) W. and G. S. West, Jour. Linn. Soc. London, Botany **33**: 292. (*E. Glaziovii* Boerg. G. M. Smith, Wis. Geol. Nat. Hist. Surv. Bull. **57**, Part II: 24, Pl. 56, f. 6).—Width 42.8 μ; length 68.5 μ; isthmus 11.0 μ. Pl. 325, f. 21.—Swamp near Falmouth. Previously reported from Wisconsin.

Our specimens are slightly larger than recorded by Smith (26) for Wisconsin forms. Also there is a slight variation in the arrangement of the granules in face view. In the New England plants there is a pair of granules within the apical margin on either side of the median notch and one at either side of the apex of the median notch. This plant certainly seems to be related to *E. evolutum*, especially when regarded in relation to integrading forms and the Wests had good reason for reducing *Glaziovii* to a variety of *evolutum*.

Euastrum humerosum Ralfs. West and West, British Desmidiaceae II: 8, Pl. 34, f. 1, 2.—Width 68.0 μ; length 114.0 μ; isthmus 16.0 μ. Pl. 325, f. 2, 3; 11, 12.—Pond near Hyannis.

This large and elegant species shows considerable variation. In this locality the most conspicuous difference is in the depth and narrowness of the upper lateral incisions with the upper lateral lobes directed at a sharper angle than in the typical form. Also in the variant of the Cape Cod region the apical lobe is distinctly anvil-shaped (Pl. 325, f. 11) as in *E. pinnatum* and *E. tuddalense*. *E.*

humerosum in Sweden as figured by Borge has an apical lobe with parallel sides, presenting an entirely different aspect from the forms that are found on the Atlantic coastal plain and in Washington where the plant has been recorded by Moore and Moore (24). In New England this form has been previously reported by Harvey from Maine (18). Described as rare in Great Britain *E. humerosum* is widely distributed in the United States, although found but a few times. It is to be noted that all records at present indicate it to be a north temperate form, with habitats in northern Europe, the northern part of the United States and Canada, west to Washington. It has, however, been found in India (W. and G. S. West) and forma *scrobiculata* is reported from Florida (Borge) and Michigan (Prescott and Magnotta).

Euastrum informe (Borge) Emend. Borge, Arkiv. f. Bot. **19**: 23, Taf. 1, f. 9, 10.

This curiously-shaped species was described by Borge from Brazil. Its appearance in Massachusetts swamps is of particular interest as it has been reported from no other locality. Since Borge was unable to obtain an empty cell for complete description I take the liberty of emending his diagnosis. He states (l. c.) "Leider sind Diagnose und Figuren ein wenig unvollständig, weil ich keine leeren Zellen gesehen habe und also das Ausverhältnismassig grosse, abgerundete Endlappen gibt aber dem Pflanzchen ein von übrigen *Euastrum*-Arten so abweichendes Aussehen, dass ich es für richtig halte, die Form als neue Art aufsustellen."

Semicells with a large median, frequently bisected, tuberculation just above the isthmus, with a slightly smaller tuberculation on the face of each basal lobe; two small tubercles on the face of the apical lobe, one on either side within the apical margin; a large granule on either side of the median notch of the apical lobe; a small, blunt spine on the wall within the lateral incision of the semicell and a blunt spine about half way on the margin of the apical lobe; a blunt spine at the lower angle of the basal lobe; semicell in side view elongate-pyramidate with a distinct incision between the lower and apical portions, lower half of the semicell with a large truncate tuberculation on each lateral margin; upper half of semicell with a small tuberculation on either side and with a smaller granule on the wall about half way between the tuberculation and the blunt, conical protuberance at the apex; in vertical view elliptic, with broadly rounded poles furnished with a blunt spine and with a similar, smaller spine on either side of the poles; three prominent tubercles on the lateral margins. Length 41.8 μ; width 19.0 μ; isthmus 3.8 μ. Pl. 00, f. 15–17.—Swamp near Hyannis.

Euastrum insigne Hass. West and West, British Desmidiaceae

II: 31, Pl. XXXVII, f. 2–5; Grönblad, Fauna et Flora Fenn. **49**: 17, Pl. 3, f. 35.—Width 56.7 μ; length 105.6 μ. Pl. 325, f. 9, 10.—Elizabeth Islands; swamps near Hyannis.

This species is quite incorrectly figured by Wolle and since Wests give only an end view in their North American algae papers it is illustrated for a record from Massachusetts. The plant as it appears in my collections is identical with a form of Grönblad (l. c.) except that his plant is much larger (64.0 μ x 144.0 μ). In side view the specimens show a broader base of the semicell than figured by Wests, with distinct shoulders on the lateral margins at the base of a long neck.

Euastrum oblongum (Grev.) Ralfs var. cephalophorum West. West and West, British Desmidiaceae II: 14, Pl. 35, f. 1.—Width 73.0 μ; length 151.0 μ. Zygospore 91.0 μ in diameter. Pl. 325, f. 1.

Only one specimen of this plant was seen, an empty semicell with a zygospore. It agrees in the essential characteristics with Wests' description of the variety (l. c.) but it is to be noted that the apical lobe of the Massachusetts plant is more like their figure of the typical form than the variety *cephalophorum*. The cell is somewhat smaller than given by Wests (90.0 μ x 155.0 μ). In this country it has been previously reported only from Michigan by Nichols and Ackley (25).

Euastrum pingue Elfv. West and West, British Desmidiaceae II: 30, Pl. 37, f. 1.—Width 39.0 μ; length 57.0 μ; isthmus 9.5 μ. Pl. 325, f. 18, 19.—Pond near Chatham. Previously reported from Me., N. J., and N. Y. (Also recorded for Newfoundland in Mss. of W. R. Taylor 27).

Except for Wolle's insufficient figures this seldom seen species has not been illustrated in American literature. The very large and eccentric pores (one showing in the face of each semicell) are distinctive of this plant.

Euastrum pulchellum de Breb. var. retusum West and West, British Desmidiaceae II: 47, Pl. LXIV, f. 17.—Width 24.0 μ; length 36.0 μ; isthmus 4.5 μ. Pl. 325, f. 13.—Swamps near Woods Hole; Elizabeth Islands.

Reported as rare in the British Isles, this species is fairly common and widely distributed in North America, having been reported from Mich., Conn., Miss., Wis., N. Y., and Canada.

In forms that the writer has seen from New England there appears to be considerable variation in the number and arrangement of granules as seen in front view. A common expression (figured herein) is one which has certain characteristics of var. *retusum* W. and G. S.

West but shows others that relate it to var. *subabruptum* Grönbl. This is particularly true for the three granules in oblique series on either side of the apical notch. The question arises as to the validity of these varieties in the light of intergrading expressions. Certainly *E. pulchellum* v. *retusum* as described by Wests seems a good variety. The figure of this variety in the manuscript of W. R. Taylor (27) however, shows a combination of characteristics of the typical form, var. *retusum* and var. *subabruptum*. The lateral spines below the apex of Taylor's specimen, if constant, are not typical for this variety, while the apical lobe, sharply set off from the basal lobes, is a character that belongs to the typical form and not to var. *retusum*. The linear arrangement of granules in Taylor's figure indicate the variation in disposition of these bodies. The figure of Hylander's (20) is not quite adequate to separate the plant from its varieties. The figure of G. M. Smith, Roosevelt Wild Life Bull. 2, Pl. 14, f. 2, appears to the writer to be not typical of this species. Certainly the emarginations of the lateral lobes are unusual and the relatively greater length of the cell gives a different aspect to his specimen.

Euastrum sinuosum Lenorm. var. reductum West and West, Jour. Linn. Soc. London, Bot. **33**: 83; British Desmidiaceae II: 22, Pl. XXXVI, f. 2, 3.—Width 38.0 μ; length 60.0 μ; isthmus 10.5 μ; thickness 27.0 μ. Pl. 325, f. 4.—Elizabeth Islands.

This plant has been reported previously from New England but has not been adequately figured in American literature. The figure of Hylander (20), who has the only New England record, does not show the definitely arranged mucous pores. In the specimens observed by the writer there is a pore in each of the five protuberances as seen in face view, as well as one showing in each of the protuberances on the lateral margins of the cell. In addition to these there is a straight row of four pores extending from the apex of the polar notch to the isthmus and a row of three just within the lateral margins as well as one on either side of the isthmus and just within the basal margin. The arrangement of the pores (exclusive of those in the protuberances) roughly describes a circle, with two pores arranged one above the other along a line bisecting the circle. Taylor in his manuscript (27) illustrates a form similar to the Massachusetts expression of this variety but the pores are arranged differently and there are none, apparently, in the protuberances.

Euastrum validum West and West, Trans. Linn. Soc. London, Botany **5**: 245, Pl. 14, f. 32, 33; British Desmidiaceae II: 75, Pl. XL, f. 21, 22.—Width 19.5 μ; length 27.0 μ; isthmus 4.5 μ. Pl. 325, f. 20.

This small and rather plain species apparently has not been reported from this country since 1896 when it was described by the Wests. Taylor (27) has found it in Newfoundland and figures it in a forthcoming paper. The habitat in America is not given by Wests (l. c.) so that this is the first definite record for Massachusetts. It is noteworthy that the New England forms have the prominent median tubercle at the base of the semicell and just above the isthmus, a feature that is apparently absent in the Newfoundland specimens. The lack of this tubercle together with the absence of a central mucilage pore suggest that the Newfoundland plant figured by Taylor (27) is a variety of *E. validum.*

EUASTRUM WOLLEI Lag., Öf. af Kongl. Vetensk.-Akad. Förhandl. **42**, No. 7: 233, Pl. 27, f. 6.—Width 101.7 μ; length 155.0 μ; isthmus 22.6 μ. PL. 325, F. 7, 8.—Elizabeth Islands; pond near Chatham.

This very handsome species has been reported previously from New England by Cushman (9) who found it in N. H., but not figured. The var. *quadrigibberum* was reported by Lagerheim (23) from Tewksbury, Mass. Since published figures in American literature do not seem adequate to the writer the plant is figured herein. Rarely met with in the United States it was first described from New Jersey by Wolle as *E. intermedium* but renamed *Wollei* by Lagerheim (l. c.).

Besides the localities already mentioned it is reported by Taylor (27) from Newfoundland and by Brown (3) from Alabama. Brown's figures (Pl. 13, f. 31, 32) are very interesting but difficult to understand because of what appear to be inconsistencies. Her front view of the cell shows a lateral protuberance on either side and below the apical angles which is not typical of this species. However, in the side view of supposedly the same plant these protuberances are lacking, or, if represented, they appear as two of the apical angles, a correct view of the plant. This species has four distinct apical angles or lobules at the apex of the polar lobe, only two being visible in face view. Brown's figure 31 appears very much as this plant does when seen at an angle from vertical. It is difficult to correlate this possible view with the fact that both poles of the cell show this arrangement of the apical angles and it would be impossible of course to see the two ends of the cell at such an angle at one time. In Brown's description of the plant and in her figures and in the figure of Lagerheim the wall is described and interpreted as being granular. In all plants that the writer has seen the wall is distinctly not granulated. It is, however, very much thickened at the apices of the lobes and is deeply pitted.

The pits give a roughened appearance to the margin of the wall at the angles and show in concentric series on the tumors in front view. It is possible that there is a granular-walled variety of this species.

Additional species of *Euastrum* recorded for Massachusetts are as follows:

Euastrum abruptum Nordst.
Euastrum affine Ralfs.
Euastrum ansatum Ralfs.
Euastrum binale (Turp.) Ralfs.
Euastrum binale f. minor West
Euastrum compactum Wolle var. major Lag.
Euastrum crassicolle Lund.
Euastrum elegans (de Breb.) Kuetz.
Euastrum everettense Wolle
Euastrum fissum W. and G. S. West.
Euastrum gemmatum de Breb.
Euastrum inerme (Ralfs) Lund.
Euastrum integrum Wolle
Euastrum magnificum Wolle
Euastrum occidentale W. and G. S. West.
Euastrum pinnatum Ralfs.
Euastrum ventricosum Lund.
Euastrum verrucosum (Ehr.) Ralfs.
Euastrum verrucosum var. alatum (Ehr.) Wolle.

Cole (Smith. Contrib. to Knowledge 2, Article 8, 1851) reported four species but his determinations are not acceptable. These are *E. rota*, *E. margaritiferum*, *E. pecten*, and *E. crux-melitensis*.

Albion College,
Albion, Michigan.

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Explanation of Plate 325

Fig. 1. Euastrum oblongum (Grev.) Ralfs var. cephalophorum West (× 246). Figs. 2–3. Euastrum humerosum Ralfs (× 409). Figs. 4–6. Euastrum sinuosum Lenorm. var. reductum West (× 573). Figs. 7–8. Euastrum Wollei Lag. (× 352). Figs. 9–10. Euastrum insigne Hass. (× 463). Figs. 11–12. Euastrum humerosum Ralfs. Forma (× 409). Fig. 13. Euastrum pulchellum Breb. var. retusum West and West (× 594). Fig. 14. Euastrum didelta (Turp.) Ralfs (× 315). Figs. 15–17. Euastrum informe (Borge) Emend. (× 778). Figs. 18–19. Euastrum pingue Elfv. (× 704). Fig. 20. Euastrum validum West and West (× 737). Fig. 21. Euastrum evolutum (Nordst.) West and West var. Glaziovii (Boerg.) West and West (× 352).

Littorella americana in Quebec.—I have been very much interested in the note of Dr. Muenscher of Cornell University concerning *Littorella americana* Fernald.[1]

As stated in the note, the distribution of this member of the family *Plantaginaceae* is: Newfoundland, Nova Scotia, Ontario, Maine, Vermont, and Minnesota. We are glad to add Quebec to this list. Macoun's *Catalogue* recorded it (as *L. lacustris*) from the north end of Lake Champlain, collected by Pringle. Prof. Marie-Victorin of the University of Montreal collected the tiny plant at Natashkwan (North Shore of the St Lawrence River). Harold St. John, who studied the Flora of this region didn't mention it, in his publication.[2] It has also been found in Lac Ste. Anne, Co. Gaspé (*Victorin*).

Last summer, whilst botanizing along the Richelieu River, I observed that this aquatic plant was common at several points on the shores of this river, such as Ste Therese Island, near St Jean. Prof. Marie-Victorin found it also on the same river, at the place named "Sabrevois." These stations are on the river which flows from Lake Champlain, whence Pringle had specimens.

The North American area is therefore: Newfoundland, Quebec, New Brunswick,[3] Nova Scotia, Ontario, Maine, Vermont, New York, Wisconsin and Minnesota.—Marcel Raymond, College de Saint Jean, Québec, Canada.

Economic Plants.—The story goes that Asa Gray, pestered by the half-intelligent and wholly practical "man on the street" with the question, "Now, what is the value of botany, anyway?", regularly replied "Why, it earns my bread and butter," or words to the same effect. Just at the present epoch the same answer cannot always be truthfully given, but, at least, the wholly impractical student of botany can, if he will, find plenty of practical answers. For instance, refer him to Chapter IX, on Food Products: Cereals and Allied Crops, in Professor Stanford's new book[4] and to the first page of the chapter: "Foods are either plant products or animal products; *if the latter, they are still products of plant metabolism* taken at second or at *n*th hand." What would the objector to botany do for food without plants and their products? In a brief note like this only the general impression can be recorded. The book is beautifully printed and well illustrated, full of organized matter of general interest, the chapters dealing, among other subjects, with forest products,

[1] Rhodora, May, 1934.

[2] Victoria Museum. A Botanical Exploration of the North Shore of St. Lawrence, including a list of the Vascular Plants. H. St John.

[3] Macoun, Cat. Can. Pl. i. 575.

[4] Economic Plants by Ernest Elwood Stanford. xxiii + 571 pages, 376 illustrations. D. Appleton-Century Co., New York and London, 1934. (The Century Biological Series) $4.50

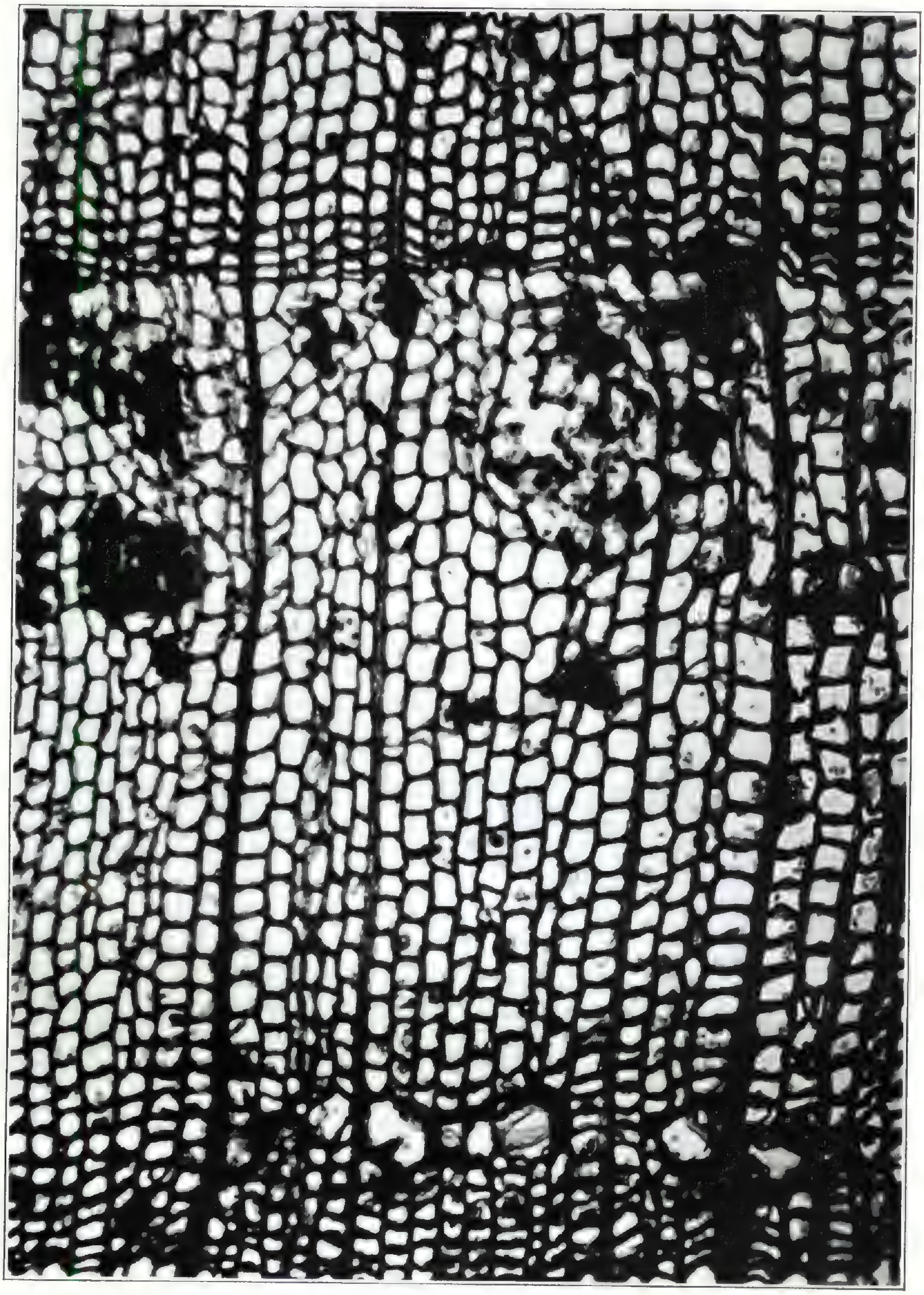
textiles, foods, sugars, oils, nitrogen, fruits, spices, beverages and medicines. It is a striking feature, perhaps a reflection of personal convictions but hardly reflecting scientific thoroughness, that no mention in the table of contents or in the index is found of alcohol, tobacco or *Nicotiana*, although tea, coffee, opium and chewing gum are all entered. The omissions can hardly reflect the author's belief that these are not at least "economic" products. The profits of some of the tobacco companies and of the wine industry in his own state of California are sufficient to merit consideration of their sources in a well rounded book. Barring such omissions, the book is full of practical, and some theoretical, information. If all who wish to understand some of the practical values of botany will buy and read it, they will help still another botanist to his "bread and butter."—M. L. F.

A RANGE EXTENSION OF DRABA RUAXES.—Among the plants collected by Robert H. Bates on the Bradford Washburn Mt. Crillon Expedition in 1933 was an arctic-alpine *Draba* which Professor M. L. Fernald has identified as *Draba ruaxes* Payson & St. John. This plant which was only recently (1930) described from Glacier Peak, Snohomish Co., Washington,[1] has been found elsewhere only at high altitudes (8000–9000 ft.) in western British Columbia.[2] On Mt. Crillon, which is south of Mt. Fayerweather in southern Alaska, *Draba ruaxes* grew on an exposed ridge at 5800 ft. which, according to the Washburn party, was the upper limit of vascular plants. This station of *Draba ruaxes* on Mt. Crillon represents a range extension north of between 450 and 500 miles. Further exploration of Alaskan mountains may well show that this *Draba* occurs even farther north.—W. B. DREW, Gray Herbarium.

[1] Payson, E. B. and St. John, H., *The Washington Species of Draba*. Proc. Biol. Soc. Wash. xliii. 117–119 (1930).

[2] I am indebted to the Provincial Museum of Natural History at Victoria, B. C. for specific information concerning the exact stations for *Draba ruaxes* in British Columbia. This *Draba* was collected by Mr. & Mrs. D. Munday in 1928 in the Mt. Waddington Region (125° 22′ long.; 51° 15′ lat.). (See Report, Prov. Mus. Nat. Hist. (Brit. Col.) 14–16 (1928)).

Volume 36, no. 432, including pages 409 to 446, plate 322 and title-page of the volume, was issued 8 December, 1934.



Transverse section of Pre-Kansan PICEA CANADENSIS.

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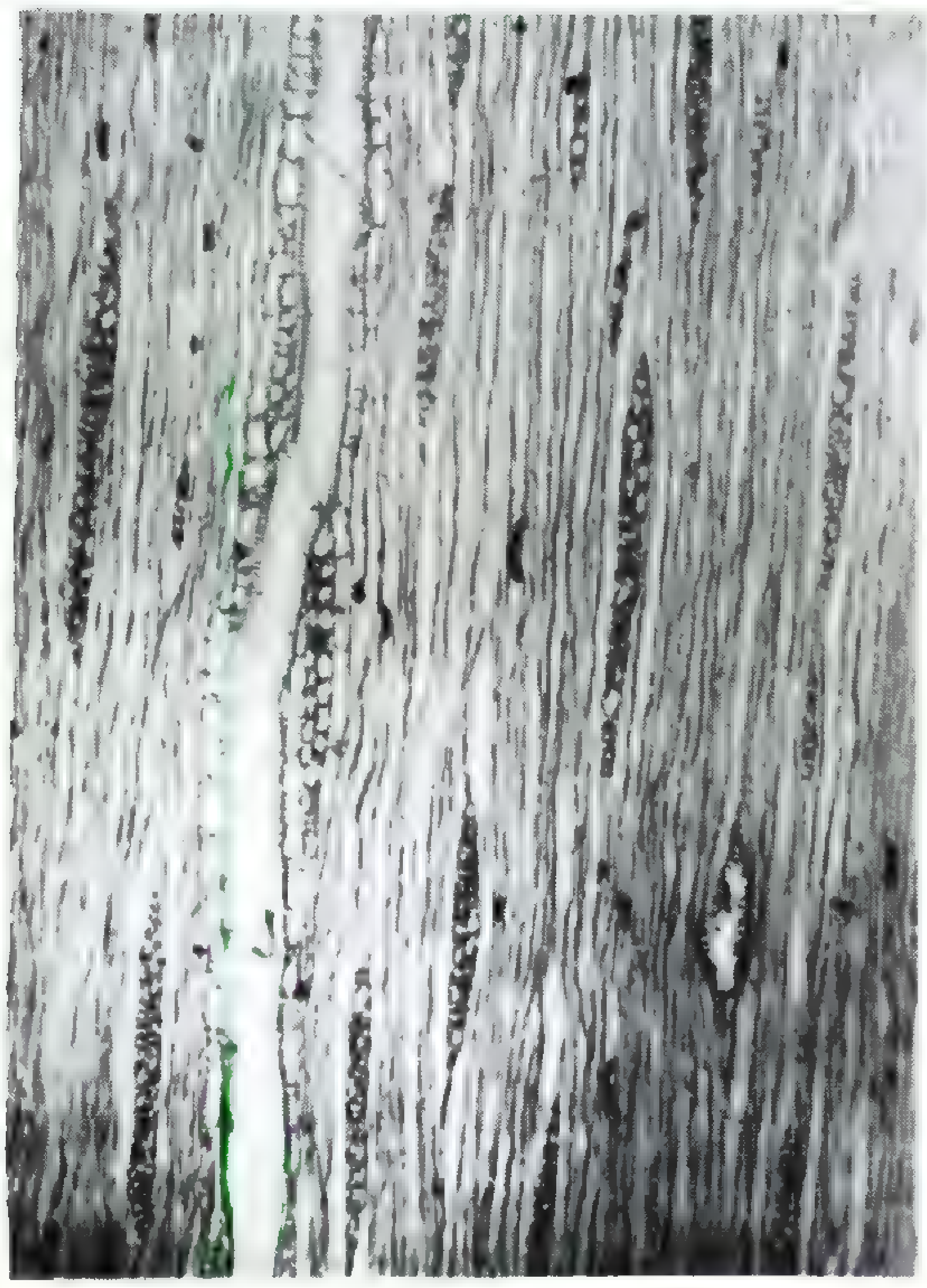

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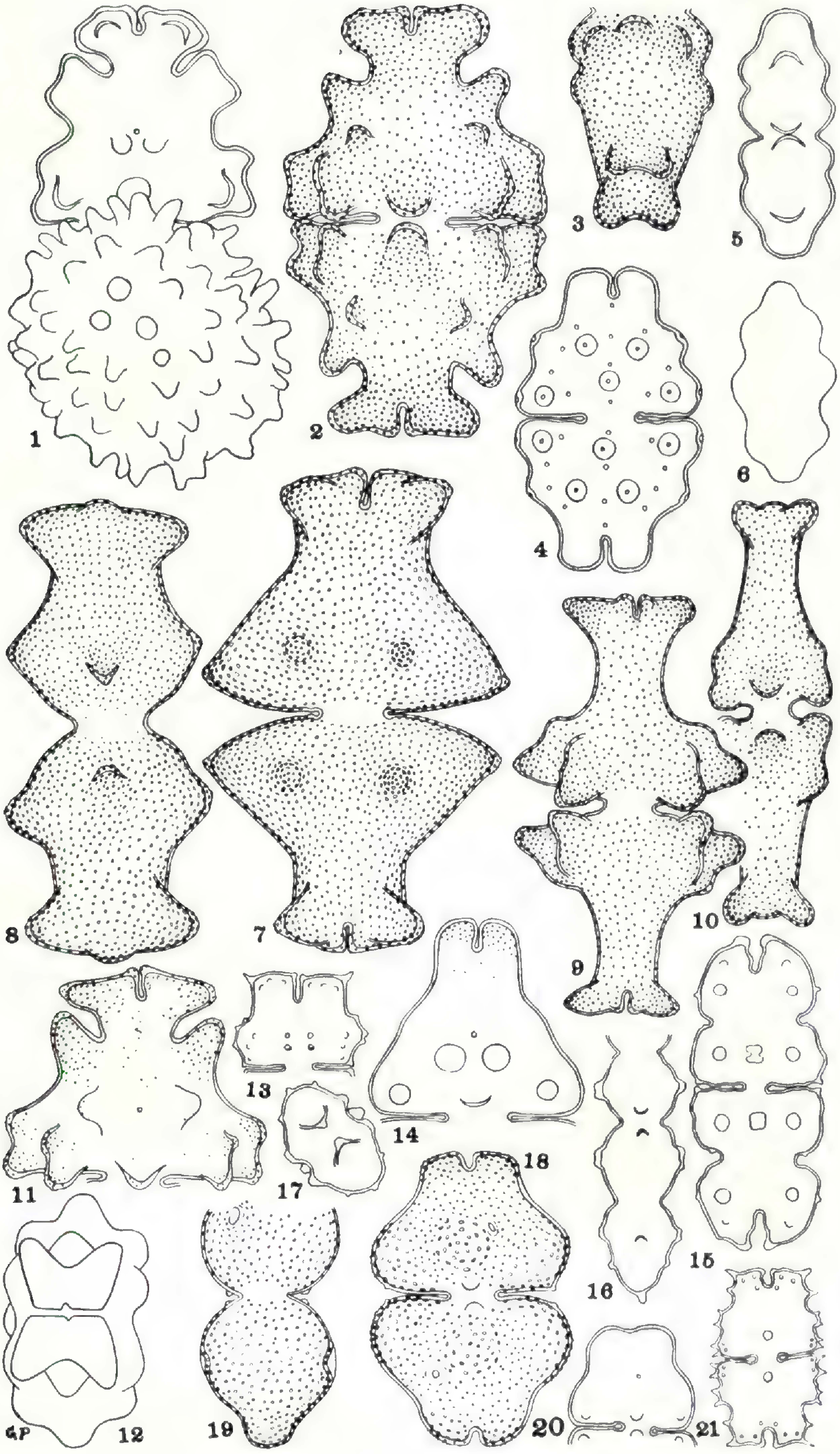

New England Species of EUASTRUM.

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NOTES ON THE CLADONIAE OF CONNECTICUT—II[1]

Alexander W. Evans

A report on the Cladoniae of Connecticut, which was based on collections made down to the close of 1928, was published by the writer in 1930.[2] This report was supplemented two years later by a series of notes, which gave the results of explorations made in various parts of the State during the years 1929, 1930, and 1931, together with revisions of certain earlier records.[3] The present series of notes represents a second supplement to the report. Although based largely on collections made in 1932 and 1933, it lists a few specimens of earlier date, in some cases correcting or revising published records. In the preparation of these notes the writer has again been privileged in having the kind coöperation of Dr. Heinrich Sandstede of Bad Zwischenahn, Oldenburg. Dr. Sandstede has determined many of the specimens listed and has examined most of the others. The writer would again express to him his grateful appreciation.

The writer is indebted also to the following botanists, who have kindly submitted specimens of Connecticut Cladoniae for determination: Mrs. J. W. Black of Mt. Carmel, Mr. B. Hartwell Clark of Hartford, Miss Margaret Fulford of Cincinnati, Mr. Ray Hansbrough of New Haven, Mrs. J. E. Hobbs of Mt. Carmel, Mr. A. D. McDonnell of New Haven, Mrs. F. H. Paine of Pomfret, and Mr. Jesse F. Smith of Suffield. In several instances these specimens have come from

[1] Contribution from the Osborn Botanical Laboratory. Published with aid to Rhodora from the National Academy of Sciences.

[2] Trans. Connecticut Acad. **30**: 357–510. 1930.

[3] Notes on the Cladoniae of Connecticut. Rhodora **34**: 121–142, 153–164. 1932.

towns which the writer has not yet been able to visit and have thus appreciably added to our knowledge of local distribution within the State.

Two papers have recently been published which have a bearing on the Cladoniae of Connecticut. The first is by Kušan and deals with the species of the subgenus Cladina occurring in Jugoslavia.[1] These species are identical with the six recorded for Connecticut, but Kušan recognizes the specific validity of only three: *C. rangiferina*, *C. sylvatica*, and *C. alpestris*. He reduces the other three species to varietal rank under *C. sylvatica* and regards the true *C. sylvatica*, according to the definition of Sandstede, as a fourth variety. The true *C. sylvatica*, therefore, in Kusan's arrangement, becomes *C. sylvatica* var. *eusylvatica* Kušan, and the other three species become var. *mitis* (Sandst.) Kušan, var. *tenuis* (Harm.) Kušan, and var. *impexa* (Harm.) Kušan, respectively. He thus distinguishes the same taxonomic entities that Sandstede recognizes but gives some of them a more subordinate rank. In a general way his broad conception of *C. sylvatica* is in accordance with the views of Vainio. The segregations from this species, however, which we owe to the studies of Harmand and Sandstede, are becoming more and more widely recognized, and both *C. mitis* and *C. tenuis* are still listed below as distinct species; *C. impexa*, unfortunately, has not been collected in Connecticut during the past two years.

The other paper, which is more popular in character, is by Torrey and discusses the "Cladoniae in the range of the Torrey Botanical Club."[2] The region in question includes "New Jersey, eastern Pennsylvania, Long Island, and the Hudson Valley in New York as far north as the Catskills." Of the forty-three species recognized all but four have been reported from Connecticut. The paper gives keys to the groups and species represented, together with numerous descriptive and distributional notes; and the accompanying plates include illustrations of thirty-five species, several of which are represented by more than one form.

Forty-nine species of Cladonia were reported from Connecticut in 1932. In the present paper 4 additional species are reported, giving a new total of 53 species for the State. One species, unfortunately, which was included in the writer's original report, can

[1] Über die angebliche *Cladonia pycnoclada* (Gaudich.) Nyl. in Jugoslawien mit besonderen Berücksichtigung der nabesteheuden Formen. Hedwigia **72**: 42–54. 1932.

[2] Torreya **33**: 109–129. *pl. 1–4*. 1933.

no longer be considered a member of the Connecticut flora. This species is the widely distributed *C. cariosa* (Ach.) Spreng., which was recorded from Killingworth on the basis of a single collection made by Hall in 1874. Hall's material, when treated with KOH, fails to give the yellow color characteristic of *C. cariosa* and should, in the opinion of Dr. Sandstede, be referred to *C. alpicola* f. *minor*, under which name it is listed on page 49. Since *C. alpicola* is new to Connecticut, the total of 53 species for the State is not affected.

The sequence adopted in the present series of notes is the same as in the 1932 series and in the 1930 report; and all page-references, unless otherwise indicated, refer to this report. The 1932 series of notes is indicated by the word "Notes," and all species or forms reported for the first time from Connecticut are marked with asterisks. Stations listed with dates alone refer to collections made by the writer; in all other cases both dates and collector's names are given. Specimens from all the stations listed are preserved in the herbarium of Yale University.

Subgenus CLADINA

CLADONIA RANGIFERINA (L.) Web. (p. 375; Notes, p. 122). Avon (1933), Burlington (1933), Canton (1933), Cheshire (1932), East Haddam (*Hansbrough*, 1933), Guilford (1932), Hebron (1933), Lebanon (1932), Litchfield (1933), Marlboro (1933), Meriden (1933), and Simsbury (1933).

CLADONIA RANGIFERINA f. TENUIOR (Del.) Mass. (Notes, p. 122). Burlington (1933) and Middletown (1932), both determined by Sandstede.

CLADONIA RANGIFERINA f. CRISPATA Coem. (p. 377; Notes, p. 122). Cheshire (1932) and Middletown (1932), both determined by Sandstede.

*CLADONIA RANGIFERINA f. HUMILIS Anders, Mitt. Nordböhm. Ver. Heimatsforsch und Wanderpflege **40**: 69. 1917; Hedwigia **61**: 356. 1920. On exposed banks, Middlefield (1932, det. Sandstede). First record for North America.

The podetia are darkened by the sunlight and form small depressed colonies, which have a more or less circular outline.

*CLADONIA RANGIFERINA f. UMBELLATA Anders, Strauch- und Laubfl. Mitteleuropas 54. *pl. 5, f. 1.* 1928. On earth in open fields. Hartland (1933) and Simsbury (1933). The latter specimen was determined by Sandstede and represents the first record for Connecticut. New to North America.

The ultimate branchlets in f. *umbellata* are arranged in radiating whorls around gaping axils. These branchlets, for the most part, are

straight or only slightly curved, instead of being distinctly curved in one direction, as in the usual forms of the species.

*Cladonia rangiferina f. patula Flot. in Sandstede, Abhandl. Naturw. Ver. Bremen **25**: 98. 1922; Rabenhorst, Kryptogamen-Flora **9**, Abt. 4²: 35. *pl. 1, f. 6.* 1931. On earth in field, Hartland (1933, det. Sandstede). First record for North America.

The podetia of f. *patula* are characterized by bearing spermagonia in abundance. These are very dark in color and terminate branchlets surrounding open axils. In the preceding form the ultimate branchlets are mostly sterile.

*Cladonia rangiferna f. setigera Oxner in Sandstede, Clad. Exsic. Bericht. Uebersicht 34. 1930; Rabenhorst, Kryptogamen-Flora **9**, Abt. 4²: 38. *pl. 1, f. 3.* 1931. In open woods, Simsbury (1933, det. Sandstede). New to North America.

The hair-like or bristle-like outgrowths found in f. *setigera* are scattered or fasciculate and vary in color from whitish to blackish. They are particularly in evidence at the tips of spermagonial branchlets. The form is a homologue of *C. tenuis* f. *setigera*.

Cladonia sylvatica (L.) Hoffm. (p. 378; Notes, p. 123). Avon (1933), Canterbury (1933), Canton (1933), East Hampton (*McDonnell*, 1932, det. Sandstede), Griswold (1933), Guilford (1932, det. Sandstede), Killingworth (*Hall*, 1874, det. Sandstede, not previously reported; *Evans*, 1932), Middletown (1932), and Voluntown (1933).

*Cladonia sylvatica f. scabrosa Leight. Lichen-Flora Great Britain, etc. 66. 1879. On earth in field, Hartland (1933, det. Sandstede). First record for North America.

The podetial surface in f. *scabrosa*, especially in the older parts, is densely verruculose. This condition is apparently associated with old age.

Cladonia sylvatica f. pygmaea Sandst. (p. 381; Notes, p. 123). Killingworth (1932).

Cladonia sylvatica f. sphagnoides (Floerke) Oliv. (p. 380). East Haddam (1933).

Cladonia mitis Sandst. (p. 381; Notes, p. 123). Barkhamsted (*McDonnell*, 1933, det. Sandstede), Canterbury (1933, det. Sandstede), Cheshire (1932), Durham (1932), East Haddam (1933), Griswold (1933), Hebron (1933), Killingworth (1932), Milford (1932), Portland (1932), Simsbury (1933), Suffield (*Smith*, 1933), Wallingford (1932), Windsor (1933), and Wolcott (1933).

Cladonia mitis f. divaricata Sandst. (p. 383). Avon (1933, det. Sandstede), East Hampton (1932), Franklin (1932), Killingworth (1932), Middletown (1932), and Simsbury (1933).

Cladonia mitis f. prolifera Sandst. (p. 383; Notes, p. 123).

Avon (1933, det. Sandstede), Cheshire (1932), Franklin (1932), Guilford (1932), Hebron (1933), and Killingworth (1932).

*Cladonia mitis f. soralifera Sandst. Abhandl. Naturw. Ver. Bremen **25**: 111. 1922 (as modification); in Rabenhorst, Kryptogamen-Flora **9**, Abt. 4^2: 61. *pl. 3, f. 3.* 1931 (as form). Sand plain, North Haven (*Miss Fulford*, 1932). This interesting form was collected by Robbins at Wareham, Massachusetts, in 1924, but no record for North America has heretofore been published.

The soredia, which are characteristic of f. *soralifera*, are grayish or yellowish in color and form conspicuous but irregular masses on the surface of the podetia. The plants bearing the soredia are prostrate or ascending and present the appearance of being poorly developed. *Cladonia mitis* is a species which does not usually produce soredia. In commenting on the sorediose forms of such species Du Rietz[1] notes that they are apparently constant in character, since they grow mixed with plants lacking soredia. He brings out the difficulty of deciding whether they arise by mutation or otherwise and emphasizes their failure to reproduce efficiently. This has prevented them from becoming independent species.

Cladonia tenuis (Floerke) Harm. (p. 384; Notes, p. 123). Avon (1933), Burlington (1933), Canterbury (1933), Canton (1933), Cheshire (1932), Franklin (1932), Griswold (1933, in part det. Sandstede), Harwinton (1933), Killingworth (1932), Lebanon (1932), Marlboro (1933), Meriden (1933), Middlefield (1932), Middletown (1932), Monroe (1933), Simsbury (1933), Southington (1932), Stafford (1932), Suffield (*Smith*, 1933), Voluntown (1933, det. Sandstede), Willington (1932), and Wolcott (1933).

Cladonia tenuis f. setigera Sandst. (Notes, p. 123). Burlington (1933), Canterbury (1933), Franklin (1932), Griswold (1933), Marlboro (1933), Simsbury (1933), Voluntown (1933), and Wethersfield (*Clark*, 1933).

Cladonia tenuis f. prolifera Sandst. (Notes, p. 123). Harwinton (1933).

Subgenus PYCNOTHELIA

Cladonia papillaria (Ehrh.) Hoffm. f. molariformis (Hoffm.) Schaer. (p. 390; Notes, p. 123). Avon (1933), Burlington (1933), Cheshire (1932), Franklin (1932), Griswold (1933), Meriden (1933), Milford (1932), Simsbury (1933), and Willington (1932).

Cladonia papillaria f. stipata Floerke (p. 391; Notes, p. 123), Killingworth (1932) and Madison (1933).

Cladonia papillaria f. papillosa Fr. (p. 391; Notes, p. 123). Burlington (1933), East Haddam (1933), Franklin (1932), Griswold (1933), Meriden (1933), Simsbury (1933), and Willington (1932).

[1] Svensk Bot. Tidskr. **18**: 388. 1924.

CLADONIA PAPILLARIA f. PROLIFERA Schaer. (Notes, p. 124). Hamden (*Mrs. Hobbs*, 1933).

Subgenus CENOMYCE

Section COCCIFERAE

Subsection SUBGLAUCESCENTES

CLADONIA FLOERKEANA (Fr.) Floerke var. CARCATA (Ach.) Vainio (p. 394; Notes, p. 124). Harwinton (1933) and Voluntown (1933).

CLADONIA FLOERKEANA var. INTERMEDIA Hepp (p. 393; Notes, p. 124). Canton (1933), Hartland (1933), Harwinton (1933), Voluntown (1933), and Wolcott (1933).

CLADONIA BACILLARIS (Ach.) Nyl. (p. 395; Notes, p. 124). Barkhamsted (1933), Burlington (1933), Canterbury (1933), Canton (1933), Griswold (1933), Harwinton (1933), Hebron (1933), Killingworth (1932), Marlboro (1933), Middletown (1932), Monroe (1932), Portland (*Evans*, 1933; *Clark*, 1933), Simsbury (1933), Trumbull (1933, det. Sandstede), Voluntown (1933), and Wolcott (1933).

CLADONIA BACILLARIS f. CLAVATA (Ach.) Vainio (p. 397; Notes, p. 124). Bristol (1933), Burlington (1933), Canton (1933), East Haddam (1933), Franklin (1932), Harwinton (1933), Salisbury (1932, det. Sandstede), Simsbury (1933), and Thomaston (1933).

*CLADONIA BACILLARIS f. MONSTROSA Harm. Lich. France **3**: 337. 1907. On soil over wood, Guilford (*Miss Fulford*, 1932, det. Sandstede). First record for North America.

The podetia of f. *monstrosa* are somewhat like those of the preceding form but are variously curved and swollen and may be sparingly branched.

*CLADONIA BACILLARIS f. SUBTOMENTOSULA Sandst. Abhandl. Naturw. Ver. Bremen **25**: 129. 1922 (as modification); in Anders, Strauch- und Laubfl. Mitteleuropas 61. 1928 (as form). On earth, more rarely on logs. Killingworth (1932, det. Sandstede), Middletown (1932, det. Sandstede), Salisbury (1932, det. Sandstede), and Voluntown (1933).

The robust podetia of f. *subtomentosula* are about 2 cm. high and gradually broaden out in the upper part, where they may attain a diameter of 2 mm. They are either simple and rounded at the apex or broken up into a few short and rounded branches. The whole apical surface is densely farinose-sorediose, and the soredia vary in color from whitish gray to pale greenish. The apothecia, if present at all, are minute and immersed, but many of the podetia are completely sterile. The form bears a certain resemblance to f. *clavata* and f. *peritheta* (Wallr.) Arn. (p. 397) but is more densely sorediose than either.

*CLADONIA BACILLARIS f. PITYROPODA Nyl. in Crombie, Grevillea

11: 115. 1883 (*nomen nudum*); Crombie, Monogr. Lich. Britain **1:** 172. 1894. On rich soil in spruce woods, Salisbury (1932, det. Sandstede). New to North America.

This interesting form is characterized by the presence of squamules on the podetia. They are found, not only in the basal portion, where their occurrence would not be unusual, but also in the apical portion. In the latter position they are frequently interspersed among the apothecia. Typical podetia of f. *pityropoda* are more or less curved, and additional squamules may be developed on the convex side of the curvature. A narrow squamulose band is thus formed, connecting in some cases the squamulose region at the base with the squamulose region at the apex. The presence of squamules indicates the presence of cortex and at once raises the question whether f. *pityropoda* should be included under *C. bacillaris* or *C. Floarkeana.* In separating these two species Vainio laid emphasis on differences in the distribution of the cortex. According to his account[1] the podetial cortex in *C. bacillaris* is almost entirely restricted to the basal region, and any squamules that may be present are similarly restricted. In *C. Floerkeana,* on the other hand, the cortex is better developed and is found throughout the entire length of the podetium, either as a continuous layer or in the form of more or less clearly defined patches; and squamules, if present at all, show a similar distribution. On the basis of this distinction f. *pityropoda* should be referred to *C. Floerkeana,* and Vainio[2] included it among the synomyms of *C. Floerkeana* var. *carcata.* Harmand,[3] however, in separating *C. Floerkeana* from *C. bacillaris,* emphasized differences in the size of the soredia. If these are large enough to be called granular, *C. Floerkeana* is indicated; if small enough to be called farinose, the plants should be referred to *C. bacillaris.* Sandstede[4] employs a similar distinction in his key, when he separates *C. Floerkeana* var. *intermedia,* with granular soredia, from *C. bacillaris,* with farinose soredia. Apparently because the soredia of f. *pityropoda* are farinose, rather than granular, he includes the form under *C. bacillaris.*[5]

*Cladonia bacillaris f. tenuistipitata Sandst. Abhandl. Naturw. Ver. Bremen **25:** 130. 1922 (as modification); in Rabenhorst, Kryptogamen-Flora **9,** Abt. 4^2: 106. *pl. 6, f. 8.* 1931 (as form). On earth in a field, Voluntown (1933, det. Sandstede). New to North America.

[1] Acta Soc. F. et Fl. Fennica **4:** 74, 90. 1887.
[2] *Ibid.* **10:** 441. 1894.
[3] Lich. France **3:** 337. 1907.
[4] In Rabenhorst, Kryptogamen-Flora **9,** Abt. 4^2: 19. 1931.
[5] *Op. cit.* 105; also Abhandl. Naturw. Ver. Bremen **18:** 400. 1906; **25:** 129. 1922.

The podetia of f. *tenuistipitata* are long and slender and are either simple or sparingly branched, with slender ascending or suberect branches. The diameter, although variable, rarely exceeds 0.5 mm. According to Sandstede the form is often associated with *C. macilenta.*

Cladonia bacillaris f. sorediata Sandst. (Notes, p. 125). Canton (1933) and Hamden (*Mrs. Black & Mrs. Hobbs*, 1933).

Cladonia bacillaris f. abbreviata (Vainio) Harm. (Notes, p. 124). Killingworth (1932), Meriden (1933), Middlefield (1932), Middletown (1932), and North Haven (1931, not previously reported). With a single exception these records are based on determinations made by Sandstede.

Cladonia macilenta f. styracella (Ach.) Vainio (p. 399; Notes, p. 125). Barkhamsted (1933), Bristol (1933), Canton (1933), East Hampton (1932), Franklin (1932), Harwinton (1933), Killingworth (1932), Lebanon (1933), Monroe (1933), Salisbury (1932), and Windsor (1933).

Cladonia macilenta Hoffm. f. granulosa Aigr. (p. 400; Notes, p. 125). Durham (1932) and Salisbury (1932).

Subsection Stramineo-flavidae

Cladonia pleurota (Floerke) Schaer. (p. 400; Notes, p. 125). Avon (1933), Burlington (1933), Canton (1933), Cheshire (1932), Colchester (1932), East Haddam (1933), Franklin (1932), Griswold (1933), Guilford (1932), Hebron (1933), Killingworth (1932), Middletown (1932), Milford (1932), Newington (*Clark*, 1933), Pomfret (*Mrs. Paine*, 1933), Voluntown (1933), Wethersfield (*Clark*, 1933), Windsor (1933), and Wolcott (1933).

cladonia pleurota f. decorata Vainio (p. 402; Notes, p. 127). East Haddam (1933), Hamden (*Mrs. Black & Mrs. Hobbs*, 1933), and Windsor (1933).

Cladonia pleurota var. frondescens (Nyl.) Oliv. (p. 403; Notes, p. 128). Colchester (1932), Hamden (*Mrs. Black & Mrs. Hobbs*), and Middletown (1932).

Cladonia pleurota f. cerina (Nagel) Oliv. (Notes, p. 128). Barkhamsted (1933, with apothecia) and East Haddam (1933, with spermagonia). The apothecial condition of this form has not previously been reported from Connecticut.

Cladonia pleurota f. albida Vainio (Notes, p. 128). Bristol (1933), Burlington (1933, det. Sandstede), Canton (1933, det. Sandstede), Harwinton (1933), and Monroe (1933, det. Sandstede).

Cladonia cristatella Tuck. (p. 403; Notes, p. 128). Portland (1933), Willington (1933), and Windsor (1933).

Cladonia cristatella f. beauvoisii (Del.) Vainio (p. 405; Notes, p. 128). Ashford (*Clark*, 1933), Barkhamsted (1933), Burlington (1933), Canterbury (1933), Canton (1933), East Haddam (*Clark*, 1933), Franklin (1932), Griswold (1933), Hamden (*Eaton*, 1866, not

previously reported, first record for town), Harwinton (1933), Lebanon (1932), Marlboro (1933), Newington (*Clark*, 1933), Simsbury (1933), Stafford (1932), Thomaston (1933), Voluntown (*Nichols*, 1933), Watertown (1933), Wethersfield (*Clark*, 1933), Willington (1932), and Wolcott (1933).

Cladonia cristatella f. vestita Tuck. (p. 407; Notes, p. 129). Ashford (*Clark*, 1933), Burlington (1933), Canterbury (1933), Canton (1933), Columbia (1933), East Haddam (*Clark*, 1932; Evans, 1933), Griswold (1933), Harwinton (1933), Killingworth (1932), Lebanon (1932), Marlboro (1933), Middletown (1932), Monroe (1933), Newington (*Clark*, 1933), Portland (1933), Simsbury (1933), Suffield (*Smith*, 1933), Thomaston (1933), Watertown (1933), Wethersfield (*Clark*, 1933), Willington (1932), and Wolcott (1933).

Cladonia cristatella f. squamosissima Robbins (p. 408; Notes, p. 129). Durham (1932) and East Haddam (1933).

Cladonia cristatella f. pleurocarpa Robbins (p. 408; Notes, p. 129). Barkhamsted (1933), East Haddam (1933), Hamden (*Mrs. Black & Mrs. Hobbs*, 1933), Lebanon (1932), Stafford (1932), and Watertown (1933).

Cladonia cristatella f. **scyphulifera** Sandst. f. nova, podetia apice verticillatim ramosa, ramis apotheceis terminatis, plus minusve unitis et scyphos irregulares formantibus, cavitatis haud profundis.

On earth and old wood. Canton (1933), Killingworth (1933), Lebanon (1932), Meriden (1933), and Windsor (1933). Most of these determinations have been made or verified by Sandstede.

The writer (p. 404) has already called attention to the fact that the podetia of *C. cristatella*, in some cases, are terminated by shallow cup-like expansions formed by whorls of branches. Dr. Sandstede now suggests that plants bearing podetia of this character be distinguished as f. *scyphulifera*. Under the most typical condition the branches are subequal in length and coalescent throughout the greater part of their extent, so that the apothecia appear sessile or short-stipitate on the margins of the expansions. In most cases, however, the branches are unequal in length and irregularly coalescent, so that the expansions become less cup-like. The podetial surface is smooth or sparingly squamulose.

Cladonia cristatella f. **aurantiaca** Robbins, f. nova, apothecia aurantiaca.

On earth and old wood. Voluntown (*Nichols*, 1933) and Windsor (1933, first record for Connecticut).

The orange-colored apothecia of f. *aurantiaca* are intermediate in color between the vivid scarlet apothecia of the typical forms of the species and the pale apothecia of f. *ochrocarpia* and f. *squamulosa*. The form was named in manuscript by Mr. Robbins.

Cladonia cristatella f. ochrocarpia Tuck. (p. 409). Canton (1933), Madison (1933), Watertown (1933), and Windsor (1933).

Cladonia cristatella f. squamulosa Robbins (p. 410; Notes, p. 129). Ashford (*Clark*, 1933) and Marlboro (1933).

Cladonia incrassata Floerke (Notes, p. 129). Branford (1932), Franklin (1932), Griswold (1933), Meriden (1933), Middletown (1932), Portland (1933), Salisbury (1932), Voluntown (1933), and Willington (1932).

Cladonia incrassata f. squamulosa (Robbins) Evans (Notes, p. 129). Branford (1932) and Griswold (1933).

Section Ochrophaeae

Subsection Unciales

Cladonia uncialis (L.) Web. (p. 413; Notes, p. 131). Berlin (*Clark*, 1932), Cheshire (1932), Griswold (1933), Hartford (*Clark*, 1933), Hartland (1933), Madison (1933), Marlboro (1933), Monroe (1933), Portland (1933), and Thomaston (1933).

cladonia uncialis f. dicraea (Ach.) Vainio (p. 416; Notes, p. 133). Pomfret (*Mrs. Paine*, 1933, det. Sandstede).

Cladonia uncialis f. obtusata (Ach.) Nyl. (p. 415). Killingworth (*Hall*, 1874, det. Sandstede, not previously reported).

Cladonia uncialis f. setigera Anders (Notes, p. 134). Bristol (1933), Canton (1933), Guilford (1932), Killingworth (1932), Middletown (1932), Salisbury (1932, det. Sandstede), and Simsbury (1933).

Cladonia uncialis f. spinosa Oliv. (p. 417; Notes, p. 133). Guilford (1932), Hartford (*Clark*, 1933), and Middletown (1932).

*Cladonia uncialis f. soraligera Robbins, Rhodora **26**: 147. 1924 (as modification); Sandstede, in Rabenhorst, Kryptogamen-Flora **9**, Abt. 4²: 190. 1931 (as form). On earth over rocks. Canton (1933), Guilford (1932, first authentic record for Connecticut), Killingworth (1932), and Middletown (1932).

As shown on p. 414 of the writer's report the record for f. *soraligera* in the "Catalogue of the Lichens of Connecticut," p. 23, was based on an incorrect determination. The form was originally described from specimens collected by Robbins at Wareham, Massachusetts, and distributed by Sandstede in his Cladoniae Exsiccatae, No. 1217.

The soredia of f. *soraligera*, which is a homologue of *C. mitis* f. *soralifera*, form irregular yellowish masses, 1–12 mm. in diameter, on the surface of the podetia. In the material from Connecticut the plants are prostrate and poorly developed, but Robbins states that the sorediate condition may sometimes be associated with erect plants.

Cladonia caroliniana (Schwein.) Tuck. f. dilatata Evans (Notes, p. 138). Berlin (*Clark*, 1932), Canterbury (1933), East Haddam

(1933), Griswold (1933), Guilford (*Miss Fulford*, 1932; *Evans*, 1932), Middletown (1932), North Haven (*Miss Fulford*, 1932), Simsbury (1933), Thomaston (1933), and Woodbridge (*Eaton*, 1875, not previously reported).

Cladonia caroliniana f. fibrillosa Evans (Notes, p. 139). Griswold (1933), Killingworth (*Hall*, 1875, mixed with f. *dilatata;* see Notes, p. 138), and Woodbridge (*Eaton*, 1875, not previously reported).

Cladonia caroliniana f. tenuiramea Evans (Notes, p. 139). Bristol (1933), East Haddam (1933), East Hampton (1932), Griswold (1933), Middletown (1932), Simsbury (1933), and Thomaston (1933).

Cladonia caroliniana f. prolifera Evans (Notes, p. 139). Bethany (*Miss Fulford*, 1932), Guilford (1932), Killingworth (1932), Middlefield (1932), Middletown (1932), and Thomaston (1933).

Cladonia boryi Tuck. f. reticulata (Russell) Merrill (Notes, p. 141). Griswold (1933), Killingworth (1932), Middletown (1933), and Simsbury (1933).

Cladonia boryi f. lacunosa (Bory) Tuck. (p. 418; Notes, p. 141). Killingworth (1932) and Simsbury (1933).

Cladonia boryi f. prolifera Robbins (p. 419). East Haddam (*Clark*, 1932).

Subsection Chosmariae

Group Microphyllae

Cladonia furcata (Huds.) Schrad. (p. 420; Notes, p. 153). Killingworth (1932), Monroe (1933), and Wethersfield (*Clark*, 1933). These records are based on specimens which are indefinite as to form.

Cladonia furcata var. racemosa (Hoffm.) Floerke (p. 422; Notes, p. 153). Canton (1933), Coventry (*Clark*, 1933), East Haddam (1933), Hartland (1933), Hebron (1933), Killingworth (*Hall*, 1874, det. Sandstede, not previously reported), Litchfield (1933), Marlboro (1933), Meriden (1933), Pomfret (*Mrs. Paine*, 1933), Portland (1933), and Voluntown (1933, det. Sandstede).

Cladonia furcata var. racemosa f. furcatosubulata (Hoffm.) Vainio (p. 422; Notes, p. 153). Branford (1932, det. Sandstede), Canton (1933, det. Sandstede), Durham (1932), East Haddam (1933), Griswold (1933), Killingworth (1933, det. Sandstede), Lebanon (1932), and Voluntown (1933, det. Sandstede).

Cladonia furcata var. racemosa f. corymbosa (Ach.) Vainio (p. 433; Notes, p. 153). Litchfield (1933).

Cladonia furcata var. racemosa f. fissa (Floerke) Aigret (Notes, p. 153). Killingworth (1932; 1933, det. Sandstede) and Portland (1933).

*Cladonia furcata var. racemosa f. arbuscula (Floerke) Anders, Strauch- und Laubfl. Mitteleuropas 73. *pl. 8, f. 8.* 1928 (as modification); Sandstede in Rabenhorst, Kryptogamen-Flora **9**, Abt. 4²: 198. 1931 (as form). *C. furcata* δ *fissa* subvar. *arbuscula* Floerke, Clad. Comm. 152. 1828. *C. furcata* var. *corymbosa* f. *arbuscula* Zahlbr.

Cat. Lich. Univ. **4**: 527. 1927. On earth in open woods, Branford (1932, det. Sandstede).

The podetia of f. *arbuscula* are fertile, as in f. *corymbosa*, but the branches bearing the apothecia form loose spreading clusters; in f. *corymbosa* the clusters are more compact.

Cladonia furcata var. racemosa f. subclausa Sandst. (p. 423). Canterbury (1933), East Haddam (1933), and Essex (1931, not previously reported). The determinations were made or verified by Sandstede.

Cladonia furcata var. racemosa f. squamulifera Sandst. (Notes, p. 153). Canton (1933), Durham (1932, det. Sandstede), East Haddam (1933), Goshen (*Miss* Sudbury, 1927, not previously reported), Killingworth (1932), Litchfield (1933), Madison (1931, listed in Notes as from Killingworth; *Clark*, 1932), Marlboro (1933), New Haven (*Nichols*, 1909, listed in Report, p. 424, as var. *pinnata*), Salisbury (1932, det. Sandstede), and Stafford (1932, det. Sandstede).

Cladonia furcata var. palamaea (Ach.) Vainio (p. 425; Notes, p. 154). Branford (1932), Durham (1932), Killingworth (1932, det. Sandstede), Lebanon (1933), and Middlefield (1932, det. Sandstede).

*Cladonia furcata var. palamaea f. implexa (Floerke) Aigret, Bull. Soc. Roy. Bot. Belgique **40**: 114. 1901 (as *C. furcata* δ. *palamaea* dd. *implexa*); Zahlbruckner, Cat. Lich. Univ. **4**: 528. 1927 (as form). *C. furcata* f. *implexa* Floerke, Clad. Comm. 146. 1828. On earth in field, Hebron (1933, det. Sandstede).

The plants in f. *implexa* form prostrate dark brown colonies. The podetia grow in all directions and are intricately branched and interwoven.

Cladonia furcata var. palamaea f. subulata (Ach.) Vainio (p. 425). Guilford (1932, det. Sandstede).

*Cladonia furcata var. palamaea f. rigidula (Mass.) Oliv. Mém. Soc. Sci. Nat. Math. Cherbourg **36**: 128. 1907. On rocks, Guilford (1932).

In the writer's report, p. 426, the present form is recorded as a variety of *C. furcata*, following the example of Vainio. Both Sandstede and Anders, however, now agree with Olivier in regarding it as a form of var. *palamaea*. The presence of squamules on the podetia make it a homologue of var. *racemosa* f. *squamulifera*.

Cladonia furcata var. pinnata (Floerke) Vainio (p. 424). Canton (1933) and New Haven (*Hall*, 1874, det. Sandstede, not previously reported).

Cladonia furcata var. pinnata f. foliolosa (Del.) Vainio (p. 424; Notes, p. 154). Portland (1933).

*Cladonia furcata var. pinnata f. *recurva* (Hoffm.) Zahlbr. Cat. Lich. Univ. **4**: 531. 1927. *C. furcata C. recurva* Hoffm. Deutschl.

Fl. **2**: 115. 1796. New Haven (*Hall*, 1874, det. Sandstede, not previously reported).

Some of the podetial branches in f. *recurva* are attenuate and more or less strongly curved, thus giving the plants a peculiar appearance. Specimens from Fayette, Iowa, collected by Fink in 1894, have been distributed in Sandstede's Cladoniae Exsiccatae, No. 664.

*CLADONIA FURCATA var. PINNATA f. TURGIDA (Scriba) Sandstede in Rabenhorst, Kryptogamen-Flora **9**, Abt. 4^2: 211. 1931. *C. furcata* f. *turgida* Scriba in Sandstede, Clad. Exsic. *1000*. 1923. Among mosses in a Chamaecyparis bog, Killingworth (1933). New to North America.

The podetia of f. *turgida*, which has a wide distribution in Europe, are irregularly branched and swollen. The ultimate branches, in many cases, are more or less incurved and may be pointed and sterile or tipped with apothecia. The podetial squamules vary greatly in abundance and may be almost lacking.

CLADONIA SCABRIUSCULA (Del.) Leight. f. FARINACEA (Vainio) Sandstede (p. 427; Notes, p. 154). Canton (1933), Durham (1932), Killingworth (1933), Lebanon (1932, 1933), Litchfield (1933), Meriden (1933), Portland (1933), Voluntown (1933), and West Hartford (*Clark*, 1932).

CLADONIA MULTIFORMIS Merrill f. FINKII (Vainio) Evans (p. 429; Notes, p. 154). Canton (1933) and Hartland (1933).

CLADONIA MULTIFORMIS f. SIMULATA Robbins (p. 429). Canton (1933).

CLADONIA MULTIFORMIS f. SUBASCYPHA (Vainio) Evans (p. 430). Killingworth (1933).

CLADONIA MULTIFORMIS f. SUBTESTACEA (Vainio) Evans (p. 430). Canton (1933).

CLADONIA SQUAMOSA (Scop.) Hoffm. (p. 432; Notes, p. 154). Canton (1933), Guilford (1932), Hartland (1933), Hebron (1933), Killingworth (1933), Portland (1933), Stafford (1932), and Voluntown (1933). The specimens upon which these records are based are not referable to definite forms.

CLADONIA SQUAMOSA f. DENTICOLLIS (Hoffm.) Floerke (p. 434; Notes, p. 154). Ashford (*Clark*, 1933), Canton (1933, det. Sandstede), Harwinton (1933, det. Sandstede), Harwinton (1933, det. Sandstede), Madison (1931, listed in Notes as from Killingworth), and Salisbury (1932, det. Sandstede).

CLADONIA SQUAMOSA f. SQUAMOSISSIMA Floerke (p. 434). Salisbury (1932).

CLADONIA SQUAMOSA f. MURINA Scriba (p. 437). Hamden (*Mrs. Black & Mrs. Hobbs*, 1933, det. Sandstede), Killingworth (1933, det. Sandstede), Middletown (1932), and Salisbury (1932, det. Sandstede).

*CLADONIA SQUAMOSA f. CALLOSA (Del.) Anders, Strauch- und

Laubfl. Mitteleuropas 81. 1928 (as var. *denticollis* f. *callosa*). *Cenomyce callosa* Del. Ms. *Cladonia pyxidata* 2) *callosa* Nyl. in Ohlert,- Schr. Königl. Physikal.-Ökonom. Ges. Königsberg **11**: 5. 1871. *C. callosa* Harm. Lich. France **3**: 326. 1907. On rocks. Guilford (1932, first collection for the State) and Middlefield (1932), both determined by Sandstede. New to North America.

The plants of f. *callosa* form compact cushions, approximately hemisphaerical in shape, on the surface of rocks. The densely crowded squamules are narrow and 3–10 mm. in length, and most of the colonies are sterile throughout. Some of the earlier writers associated f. *callosa* with *C. pyxidata*, but Sandstede[1] showed that it lacked the bitter taste characteristic of *C. pyxidata* and its allies. Comparison of the plant with depauperate forms of the mild-tasting *C. squamosa* convinced him that f. *callosa* should be included under that species, and it was soon definitely placed there by Anders, as indicated in the synonymy.

Cladonia squamosa f. phyllocoma (Rabenh.) Vainio (p. 434; Notes, p. 154). Hamden (*Mrs. Black & Mrs. Hobbs*, 1933) and Stafford (1932), both determined by Sandstede.

*Cladonia squamosa f. clavariella Vainio, Acta Soc. F. et Fl. Fennica **4**: 443. 1887; Zahlbruckner, Cat. Lich. Univ. **4**: 595. 1927 (as variety). On banks, rocks, and logs. Canton (1933), Hartland (1933), Litchfield (1933), and Voluntown (1933). The determinations were made by Sandstede. Not before reported from North America.

The podetia, as brought out by Vainio's original description and by the later description of Sandstede,[2] are cupless, irregularly branched, 7–25 mm. in height, 0.7–2 mm. in diameter, and blunt at their apices. Throughout the greater part of their length they are densely covered with small squamules, among which a few larger squamules may be interspersed. Toward the tips of the podetia the surface is more or less decorticate and presents a somewhat granulose appearance. In many cases the more typical podetia of f. *clavariella* are associated with plants in which the distinctive peculiarities of the form are only partially realized.

*Cladonia squamosa f. phyllopoda Vainio, Acta Soc. F. et Fl. Fennica **4**: 441. 1887. *C. squamosa* var. *muricella* f. *phyllopoda* Oliv. Mem. Soc. Sci. Nat. Math. Cherbourg **36**: 133. 1907. On rocks. Milford (1931, det. Sandstede, not previously reported) and Wolcott (1933, det. Sandstede). New to North America.

The primary thallus in f. *phyllopoda* is persistent and well-developed, being formed (according to Vainio's account) of squamules

[1] Abhandl. Naturw. Ver. Bremen **25**: 214. 1922.

[2] In Rabenhorst, Kryptogamen-Flora **9**, Abt. 4^2: 273. 1931.

3–5 mm. long and 2–3 mm. wide. The podetia which are only 2–8 mm. in height, are poorly developed and variable. In some cases they are subulate, in others more or less distinctly cup-forming, and the surface is either sparingly squamulose or smooth.

Cladonia squamosa f. levicorticata m. rigida (Del.) Evans (p. 435; Notes, p. 154). Middletown (1932, det. Sandstede).

*Cladonia carassensis Vainio, Acta Soc. F. et Fl. Fennica **4**: 313. 1887. On log in Chamaecyparis swamp, Stafford (1932, det. Sandstede).

The original material of *C. carassensis* was collected "in montibus Carassae," Brazil, by Vainio in 1885. Nearly forty years later Robbins found the species at Wareham, Massachusetts, and based two new forms and a new modification on his specimens.[1] The discovery of the species in Connecticut represents an interesting addition to the flora of the State.

In its general appearance *C. carassensis* bears a strong resemblance to certain forms of *C. crispata* (Ach.) Flot. and *C. squamosa* but is distinguished from both by giving a distinct yellow reaction with KOH. It agrees in this respect with *C. subsquamosa* (Nyl.) Vainio, another northern species with open cups. In *C. subsquamosa,* however, the podetial surface is more or less granular, whereas in *C. carassensis* the surface is smooth throughout. Since *C. subsquamosa* has been reported from Quebec and the State of Washington, it is perhaps to be expected in Connecticut.

The specimens from Stafford are much like f. *subregularis* Vainio, one of the two Massachusetts forms described by Robbins. They agree in having podetia 20–40 mm. high, with moderately dilated cups and a surface free or nearly so from squamules. The color of the podetia, however, instead of being a mixture of glaucescent and olivaceous shades, as in f. *subregularis,* is uniformly grayish except at the tips of the branches. For this reason the Stafford specimens are referred simply to the species.

Cladonia cenotea (Ach.) Schaer. f. exaltata Nyl. (Notes, p. 155). Willington (*Clark,* May 30, 1932; *Evans,* June 4, 1932), the second station for the State.

Cladonia delicata (Ehrh.) Floerke f. quercina (Pers.) Vainio (p. 439; Notes, p. 156). Durham (1932), Killingworth (1932), and Voluntown (1933).

Cladonia caespiticia (Pers.) Floerke (p. 439; Notes, p. 156). Bristol (1933), Burlington (1933), Canton (1933), East Haddam (1933), Guilford (*Clark,* 1933), Harwinton (1933), Killingworth

[1] Rhodora **26**: 146, 147. 1924.

(1932), Southington (1932), Voluntown (1933), and Watertown (1933).

Group Megaphyllae

Cladonia apodocarpa Robbins (p. 440; Notes, p. 156). Canton (1933), Cheshire (1932), Colchester (1933), Durham (1932), Guilford (*Miss Fulford*, 1932; *Evans*, 1932), Harwinton (1933), Killingworth (1932), Marlboro (1933), Middlefield (1932), Middletown (1932), Newington (*Clark*, 1933), and Suffield (*Smith*, 1933).

Cladonia turgida (Ehrh.) Hoffm. (p. 441). Salisbury (1932).

Cladonia turgida f. scyphifera Vainio (p. 442). Hartland (1933).

Cladonia turgida f. corniculata Floerke (p. 442). Salisbury (1932).

Subsection Clausae

Group Podostelides

Subgroup Helopodium

Cladonia mitrula Tuck. f. imbricatula (Nyl.) Vainio (p. 444; Notes, p. 156). Burlington (1933), Canton (1933), Columbia (1933), Killingworth (1932), Meriden (1933), Portland (1933), Suffield (*Smith*, 1933), Thomaston (1933), Voluntown (1933), Watertown (1933), and Wethersfield (*Clark*, 1933).

Cladonia clavulifera Vainio f. nudicaulis Evans (p. 447; Notes, p. 156). Burlington (1933), Canterbury (1933), Killingworth (1933), Madison (1933), and Voluntown (1933).

Cladonia clavulifera f. subvestita Robbins (p. 447; Notes, p. 156). Guilford (1932, det. Sandstede), Killingworth (1933), and Madison (1933).

Cladonia subcariosa Nyl. (p. 449). Hamden (*Mrs. Hobbs & Mrs. Black*, 1933) and Suffield (*Smith*, 1933), both specimens without podetia.

Cladonia subcariosa f. evoluta Vainio (p. 450; Notes, p. 156), Avon (1933), Canton (1933), Durham (1932), Franklin (1932), Hebron (1933), Killingworth (1933), Lebanon (1932), Middlefield (1932), Pomfret (*Mrs. Paine*, 1933), Portland (1933). Simsbury (1933), Wethersfield (*Clark*, 1933), and Wolcott (1933).

Cladonia subcariosa f. pleurocarpa Robbins (p. 451). Durham (1932).

Cladonia subcariosa f. squamulosa Robbins (p. 451; Notes, p. 156). Durham (1932) and Guilford (1932).

Cladonia brevis Sandst. (Notes, p. 156). Avon (1933), Burlington (1933), and Madison (1933).

Subgroup Macropus

Cladonia alpicola (Flot.) Vainio (p. 452). The var. *karelica* Vainio of this species was listed on p. 452, on the basis of two speci-

mens. It was shown in the Notes, however, that one of these specimens represented *C. strepsilis* f. *glabrata*, whereas the other represented *C. brevis*. It was further shown that several other North American specimens, which had been determined as var. *karelica*, were likewise referable to *C. brevis*. It is now possible to record from Connecticut another Cladonia which authors include under *C. alpicola*, although it is not altogether certain that it belongs there. The Cladonia in question is the following:

*CLADONIA ALPICOLA f. MINOR (Vainio) Kovář, Věstnik Klubu přirod. Prostějově **15**: 154. 1912. *Cladonia alpicola α. foliosa* f. *minor* Vainio, Acta Soc. F. et Fl. Fennica **10**: 64. 1894. On earth. Griswold (1933, ver. Sandstede) and Killingworth (*Hall*, 1874, det. Sandstede, listed on p. 449 as *C. cariosa* f. *squamulosa*).

Although Vainio considered the present plant an inconstant form of var. *foliosa* (Sommerf.) Vainio, the Connecticut specimens differ from the usual forms of this variety in several respects. The podetia, for example, instead of being 1–6 cm. in height, are only 3–6 mm. in height; and the podetial surface, instead of being squamulose, is nearly or entirely free from squamules. The podetia, in the majority of cases, are cylindrical, unbranched, and tipped with dark brown apothecia, which are more or less peltate. The cortex shows definite areolae, which are either close together or somewhat separated from one another, thus exposing the translucent medulla.

Since the podetia of f. *minor* are apparently destitute of spermagonia, there is a possibility that the plant should be associated with members of the subgroup Helopodium. There are, in fact, two species of this group which f. *minor* resembles morphologically and with which it further agrees in being negative with KOH. These species are *C. clavulifera* and *C. brevis*. In *C. clavulifera*, however, the podetial cortex is continuous or subcontinuous throughout, and in *C. brevis*, which is a slightly larger plant, the podetia increase in diameter upward. Unfortunately the position of the spermagonia in f. *minor* has not yet been satisfactorily demonstrated, so that its place in the system must remain in doubt.

Group THALLOSTELIDES

CLADONIA GRACILIS (L.) Willd. var. DILATATA (Hoffm.) Vainio (p. 457). Canton (1933).

CLADONIA VERTICILLATA (Hoffm.) Schaer. (p. 458). Hamden (*Eaton*, 1866, not previously reported) and Windsor (1933); both specimens are young.

Cladonia verticillata f. evoluta (Th. Fr.) Stein (p. 459; Notes, p. 159). Burlington (1933), Canton (1933), Durham (1932), Griswold (1933), Harwinton (1933), Lebanon (1932), Meriden (1933), Pomfret (*Mrs. Paine*, 1933), Simsbury (1933), and West Hartford (*Clark*, 1932).

*Cladonia verticillata f. aggregata (Del.) Oliv. Fl. Lich. de l'Orne 52. 1882. *C. cervicornis* var. *verticillata* f. *aggregata* (Del.) Malbr. Suppl. Lich. Normandie 11. 1881. *C. verticillata* var. *evoluta* f. *aggregata* Zahlbr. Cat. Lich. Univ. **4**: 626. 1927. On shaded earth. Durham (1932) and Watertown (1933).

The proliferations from the upper surface of the cups, instead of being single, as in f. *evoluta*, are numerous and closely packed together.

Cladonia verticillata f. apoticta (Ach.) Vainio (p. 460; Notes, p. 159). Burlington (1933) and Harwinton (1933).

Cladonia verticillata f. phyllocephala (Flot.) Oliv. (p. 461). Canton (1933).

Cladonia mateocyatha Robbins (p. 461). Monroe (1933) and Pomfret (*Mrs. Paine*, 1933); the specimens show the thallus only.

Cladonia mateocyatha f. leioscypha Evans (p. 462; Notes, p. 159). Avon (1933), Griswold (1933), and Meriden (1933).

Cladonia mateocyatha f. squamulata Robbins (p. 462; Notes, p. 159). Avon (1933), Meriden (1933), Monroe (1933), and Windsor (1933).

Cladonia pyxidata (L.) Hoffm. var. neglecta (Floerke) Mass. f. simplex (Ach.) Harm. (p. 464; Notes, p. 159). Bristol (1933), Durham (1932, det. Sandstede), East Haddam (1933), Hamden (*Mrs. Hobbs & Mrs. Black*, 1933), Harwinton (1933), Hebron (1933), Killingworth (*Hall*, 1875, det. Sandstede, not previously reported), Madison (1933), Marlboro (1933), Meriden (1933), New Haven (*Nichols*, 1909, not previously reported), Simsbury (1933), and Stafford (1932, det. Sandstede). The three specimens determined by Sandstede were referred simply to var. *neglecta*. The records for Killingworth and New Haven antedate those given on p. 464.

Cladonia pyxidata var. neglecta f. lophyra (Ach.) Koerb. Hamden (*Mrs. Hobbs & Mrs. Black*, 1933).

*Cladonia pyxidata var. pocillum (Ach.) Flot. f. caesiocinerea Bouly de Lesdain, Bull. Soc. Bot. France **68**: 16. 1921. On rocks, Milford (1927, det. Sandstede, not previously reported). New to North America. The Milford specimens of var. pocillum, listed on p. 159 of the Notes, approach f. *caesiocinerea*.

According to the description of Sandstede[1] the primary squamules of f. *caesiocinerea*, which are characterized by their ashy to bluish color, unite to form rosettes with a diameter of about 4 cm. In the middle of the rosette they are relatively small and imbricated; to-

[1] In Rabenhorst, Kryptogamen-Flora 9, Abt. 4²: 408. 1931.

ward the periphery they are larger and appressed to the substratum. The podetia are sparingly produced.

*Cladonia magyarica Vainio var. pocilliformis Vainio in Anders, Arch. Protistenk. **71**: 501. *pl. 21, f. 1.* 1930. On earth. East Haddam (*Clark*, 1932, det. Sandstede). New to the United States.

The species, as well as the var. *pocilliformis*, was based on Hungarian material. Sandstede,[1] however, records the variety, not only from Hungary, but also from Sweden, Switzerland, Algeria, Istria, Macedonia, and the West Indian republic of Haiti.

This interesting species is a close relative of *C. pyxidata* but is distinguished by giving a distinct yellow reaction with KOH. Sandstede notes that var. *pocilliformis* agrees with *C. pyxidata* var. *pocillum* in forming definite rosette-like clusters. The squamules in the middle of these clusters are appressed and brownish, whereas those at the periphery are ascending and grayish green. The podetia, which lack soredia, are more slender than those of var. *pocillum*, and the cups are less expanded.

Cladonia chlorophaea (Floerke) Spreng. (p. 465; Notes, p. 139). Avon (1933), Barkhamsted (1933), Bridgewater (1928), Burlington (1933), Canterbury (1933), Canton (1933), Cheshire (1932), Colchester (1932), East Haddam (1933), Goshen (1927, not previously reported), Hamden (*Mrs. Black & Mrs. Hobbs*, 1933), Hartland (1933), Killingworth (1932, 1933), Lebanon (1932), Litchfield (1933), Madison (1932), Middlefield (1932), Portland (1933), Shelton (1928, listed in Report as f. *simplex*), Voluntown (1933), West Hartford (*Clark*, 1932), and Wolcott (1933). The determinations upon which these records are based were made or verified by Sandstede.

Cladonia chlorophaea f. costata (Floerke) Arn. (p. 469). Hamden (*Mrs. Hobbs*, 1932, det. Sandstede).

*Cladonia chlorophaea f. pseudotrachyna (Harm.) Sandst. Abhandl Naturw. Ver. Bremen **25**: 221. 1922. *C. pyxidata* var. *chlorophaea* f. *pseudotrachyna* Harm. Lich. France **3**: 305. 1907. On earth in woods, Burlington (1933, det. Sandstede). Not previously reported from North America.

The podetia of f. *pseudotrachyna* are once or twice proliferous, but the ultimate proliferations are not distinctly scyphiferous. They are rather in the form of cylindrical or flattened outgrowths, in most cases tipped with apothecia. The podetial surface is granular or verruculose, except in the sorediose areas, which become decorticate and whitish. The podetia are further distinguished by being more or less furrowed or lacerate. Sandstede gives an excellent figure

[1] In Rabenhorst, Kryptogamen-Flora 9, Abt. 4^2: 411. 1931.

of f. *pseudotrachyna*,[1] which he compares with f. *costata*, a more delicate and slender plant. The figure shows podetial squamules in some abundance, and these are present also in the North American specimens.

Cladonia chlorophaea f. pterygota (Floerke) Vainio (p. 470). Hamden (*Mrs. Black*, 1933) and Shelton (1928, previously reported simply as *C. chlorophaea*). The determinations were made by Sandstede.

*Cladonia chlorophaea f. intermedia Sandst. in Rabenhorst, Kryptogamen-Flora **9**, Abt. 4^2: 422. *pl. 29, f. 8*. 1931. On earth. Canton (1933) and Guilford (1928, listed on p. 468 as *C. chlorophaea* f. *simplex*). The determinations were made by Sandstede. Not previously reported from North America.

Under the above name Sandstede distinguishes a form of *C. chlorophaea* in which the cups are typically simple and more or less toothed along the margin. The teeth in some cases are tipped with spermagonia but many of the podetia are completely sterile. The podetial cortex, which is persistent to above the middle, is smooth at the very base but forms crowded or scattered verruculae throughout the greater part of its extent. Toward the margins of the cups the surface is sorediose and soon becomes decorticate and whitish.

Cladonia chlorophaea f. lepidophora (Floerke) Sandst. (p. 471). Colchester (1932) and Hamden (*Mrs. Hobbs*, 1933), both determined by Sandstede.

Cladonia chlorophaea var. pachyphyllina (Wallr.) Vainio (p. 472; Notes, p. 159). Durham (1932, det. Sandstede, as f. *pachyphyllina*).

Cladonia Grayi Merrill (Notes, p. 159). Berlin (1927), Bethany (1925, 1927), Branford (1928, 1932), Bridgewater (1928), Bristol (1933), Burlington (1933), Canterbury (1933), Canton (1933), Cheshire (1932), Cornwall (1928), Darien (1926), Durham (1928), East Haddam (*Clark*, 1932), East Hampton (1928, 1932), East Haven (*Miss Meyrowitz*, 1922), Essex (1927), Glastonbury (*Miss Sudbury*, 1927, not previously reported), Griswold (1933), Guilford (1925, listed in the Catalogue[2] as *C. pyxidata* intermediate between vars. *chlorophaea* and *neglecta;* 1928; 1932; *Miss Fulford*, 1932), Hamden (*Mrs. Black*, 1933), Killingworth (*Hall*, 1874, not previously reported; 1932; 1933), Litchfield (1927, 1933), Madison (1927; 1931, listed in the Notes as from Killingworth, not new to town), Meriden (*Musch & Nichols*, 1926), Middlefield (1932), Monroe (1933), Norfolk (*Nichols*, 1912), North Branford (*Musch & Evans*, 1927; *Evans*, 1927, not new to town), North Haven (1927), Plainville (*Wright*, 1883), Portland

[1] In Rabenhorst, Kryptogamen-Flora 9, Abt. 4^2: *pl. 29, f. 3*. 1931.

[2] Evans & Meyrowitz, Catalogue of the Lichens of Connecticut. Connecticut Geol. and Nat. Hist. Survey. Bull. 37. 1927.

(1933), Salisbury (1932), Seymour (1928, not previously reported), Shelton (1928), Simsbury (1933), Southington (1932), Stamford (*Marshall*, 1928; *Evans*, 1928), Stratford (1933), Union (1927), Willington (1932), Windsor (1928), and Wolcott (1933). The determinations were all made by Sandstede; unless otherwise indicated, stations dated 1928 or earlier are listed in the writer's report under *C. chlorophaea* or one of its forms.

*Cladonia Grayi f. cyathiformis Sandst. in Rabenhorst, Kryptogamen-Flora **9**, Abt. 4^2: 429. 1931. On banks. Meriden (1927, listed on p. 471 as *C. chlorophaea* f. *carpophora*) and Prospect (1928, listed on p. 469 as *C. chlorophaea* f. *simplex*), both determined by Sandstede. Not before recorded from North America.

According to Sandstede the primary squamules of f. *cyathiformis* are firmer than those of the ordinary forms of the species, and the podetia, which are for the most part sterile, are shorter and usually form broad and shallow cups.

cladonia conista (Ach.) Robbins f. simplex Robbins (p. 473; Notes, p. 160). Burlington (1933), Canton (1933), Durham (1932), Harwinton (1933), Killingworth (1933), Lebanon (1932), Marlboro (1933), and Thomaston (1933).

Several of these specimens have been determined as *C. fimbriata* f. *conista* by Dr. Sandstede. He has kindly pointed out in a letter that this form is perhaps understood in too broad a sense, so that it includes, not only the plant originally distinguished by Acharius, but also the plant described by Harmand under the name *C. pyxidata* var. *chlorophaea* f. *conistea* Del.[1] Dr. Sandstede refers to the latter form, with some question, three of the specimens listed above. The writer, however, is not yet able to distinguish clearly between f. *conistea* and what Robbins called *C. conista* and therefore lists these questionable specimens, at least provisionally, under the latter species.

Cladonia fimbriata (L.) Fr. (p. 473; Notes, p. 160). Burlington (1933), Colebrook (*Nichols*, 1912, det. Sandstede, listed on p. 468 as *C. chlorophaea* f. *simplex*), East Haddam (1933), Guilford (*Miss Fulford*, 1932, det. Sandstede, thallus only), Lebanon (1933, det. Sandstede), Litchfield (1933), Madison (1933, det. Sandstede, thallus only), and Simsbury (1933, det. Sandstede).

The records for *C. fimbriata*, which are given on p. 474 of the writer's Report, were all based on specimens of *C. major* and are listed below under that species. There is doubt also about the systematic position of the specimens listed under f. *stenoscypha* Evans on p. 475. According to Sandstede's definition of *C. fimbriata* the podetia are always cup-forming. Since the podetia of f. *stenoscypha*

[1] Lich. France 3: 304. 1907.

may be either cup-forming or subulate, the form does not agree with this definition. In fact Sandstede, in a letter, transfers it to *C. coniocraea* and suggests its identity with *C. fimbriata* var. *apolepta* f. *stenoscypha* Stuckenberg,[1] which was based on Russian specimens. It is to be hoped that he may throw further light on these critical plants in his published writings.

*Cladonia fimbriata f. exilis (Hoffm.) Crombie, Jour. Linn. Soc. Bot. **17**: 558. 1880. *C. pyxidata* **C. exilis* Hoffm. Deutschl. Fl. **2**: 121. 1796. *C. fimbriata* var. *simplex* f. *exilis* Zahlbr. Cat. Lich. Univ. **4**: 508. 1927. On a sandy bank, North Haven (1931, det. Sandstede, not previously reported). New to North America.

The slender podetia of f. *exilis* are only 0.5–1 mm. in diameter and, in most cases, less than 1 cm. in height. They are delicate in texture and may be more or less constricted below the narrow cups. Sandstede[2] gives an excellent illustration of the form and expresses the opinion that it may sometimes represent a juvenile stage of development.

*Cladonia major (Hag.) Sandst. Abhandl. Naturw. Ver. Bremen **25**: 223. 1922. *Lichen pyxidatus* β. *major* Hag. Tent. Hist. Lich. 113. 1782. *Cladonia fimbriata* var. *simplex* f. *major* Vainio, Acta Soc. F. et Fl. Fennica **10**: 258. 1894 (as α. *simplex* α. *major*); Zahlbruckner, Cat. Lich. Univ. **4**: 509. 1927 (as var. *simplex* f. *major*). On earth. Ashford (*Clark*, 1933), Barkhamsted (1933), Burlington (1933), Goshen (*Miss Sudbury*, 1927), Killingworth (1932, 1933), New Haven (*Nichols*, 1912), and North Canaan (1928). The specimens from Ashford and Burlington were determined by the writer, the others by Sandstede.

The writer (p. 474) has already called attention to the chemical differences between *C. fimbriata* and *C. major*. From a morphological standpoint the two species are much alike and both produce relatively slender podetia, which broaden out gradually into distinct cups. In some cases the cups expand more abruptly in the upper part, so that the mouth flares more or less, but in most of the podetia the mouth remains relatively narrow. Both species produce farinose soredia in abundance, and the mature podetia are destitute of a cortex except perhaps at the base. The most obvious differences between *C. fimbriata* and *C. major* are differences in size. According to Sandstede's data the podetia in the usual forms of *C. fimbriata* are 1–2 mm. in diameter and up to 20 mm. in height; in *C. major*, on

[1] Recherches sur les Cladonies des gouv. de Penza et de Saratow **60**. *pl. 3, f. 8*. 1917.

[2] In Rabenhorst, Kryptogamen-Flora **9**, Abt. 4²: 432. *pl. 30, f. 6*. 1931.

the contrary, they may be as much as 3 mm. in diameter and up to 40 mm. in height; the cups, in fact, may expand to a diameter of as much as 12 mm. at the mouth. The podetia of *C. major*, although normally simple, proliferate more frequently than those of *C. fimbriata;* and the cortex lining the inside of the cups, although ultimately broken up into soredia, persists longer than in *C. fimbriata*. In *C. major*, moreover, the corticate area at the base of the podetia tends to be fairly extensive and may reach to above the middle; in *C. fimbriata* the corticate area, if present at all, is restricted to the base.

Cladonia nemoxyna (Ach.) Nyl. (p. 475; Notes, p. 160). Barkhamsted (1933), Canton (1933), Durham (1932), Griswold (1933), Harwinton (1933), Marlboro (1933), Portland (1933), Suffield (*Smith*, 1933), Thomaston (1933), Watertown (1933), West Hartford (*Clark*, 1932), and Wethersfield (*Clark*, 1933).

Cladonia nemoxyna f. fibula (Ach.) Vainio (p. 477; Notes, p. 160). Durham (1932), Griswold (1933), Voluntown (1933), and Wethersfield (*Clark*, 1933).

Cladonia coniocraea (Floerke) Spreng. f. ceratodes (Floerke) Dalla Torre & Sarnth. (p. 479; Notes, p. 160). Ashford (*Clark*, 1933), Burlington (1933), Canton (1933), Coventry (*Clark*, 1933), East Haddam (*Clark*, 1933), Glastonbury (*Miss Sudbury*, 1927, not previously reported), Guilford (*Clark*, 1933), Harwinton (1933), Killingworth (1933), Litchfield (1933), Middletown (1932), Simsbury (1933), Stafford (1932), Suffield (*Smith*, 1933) Voluntown (1933), West Hartford (*Clark*, 1932), and Wolcott (1933).

Cladonia coniocraea f. truncata (Floerke) Dalla Torre & Sarnth. (p. 480; Botes, p. 160). Ashford (*Clark*, 1933), Bethany (*M. Fulford*, 1932), Canton (1933, in part det. Sandstede) East Haddam (1933), Harwinton (1933), Litchfield (1933), Middletown (1932), Portland (1933), Salisbury (1932), Stafford (1932), Voluntown (1933), and West Hartford (*Clark*, 1932).

Cladonia coniocraea f. expansa (Floerke) Sandst. (Notes, p. 160). Madison (1931, listed in the Notes as from Killingworth).

Cladonia coniocraea f. robustior (Harm.) Sandst. (Notes, p. 161). Durham (1932), Guilford (1933), and Salisbury (1932, det. Sandstede).

Cladonia coniocraea f. pycnotheliza (Nyl.) Vainio (Notes, p. 161). Killingworth (1933).

*Cladonia ochrochlora Floerke, Clad. Comm. 75. 1828. *C. fimbriata* var. *ochrochlora* Vainio, Acta Soc. F. et Fl. Fennica **10**: 319. 1894 (as *C. fimbriata* δ. *ochrochlora*); Zahlbruckner, Cat. Lich. Univ. **4**: 502. 1927 (as variety). On earth and rotten wood. North Haven (1931, det. Sandstede, not previously reported), Salisbury (1932), and Voluntown (1933).

The relationship between *C. ochrochlora* and *C. coniocraea* is very

close, and it is only recently that they have been specifically distinguished. Even at the present time they are still regarded by certain authors as varieties of *C. fimbriata.* The species agree with each other in many of the characters drawn from the podetia. In both species, for example, these may be either narrowly cup-forming or subulate and always produce an abundance of farinose soredia. In *C. coniocraea,* however, the sorediose area is more extensive than in *C. ochrochlora.* It involves not only most of the external surface but also the inner surface of the cups. The corticate areas, in fact, if present at all, are restricted to the basal portion and to the region just below the apothecia. In *C. ochrochlora,* on the other hand, the inner surface of the cups is corticate, the basal and subapical corticate areas are larger, and corticate patches may be scattered about in the sorediose regions.

Cladonia borbonica (Del.) Nyl. f. cylindrica Evans (p. 482; Notes, p. 161). Burlington (1933), Canton (1933), Cheshire (1932), East Haddam (*Clark*, 1932; *Evans*, 1933), Guilford (1933), Killingworth (1932), Litchfield (1933), Meriden (1933), Middlebury (*Musch & Evans*, 1929, not previously reported), Middletown (1932), Portland (1933), Simsbury (1933), Stafford (1932), Voluntown (1933), and Watertown (1933).

Cladonia borbonica f. squamulosa Robbins (p. 482; Notes, p. 161. Cheshire (1932), East Haddam (1933), and Watertown, 1933).

Cladonia pityrea (Floerke) Fr. var. Zwackhii Vainio f. subacuta Vainio (p. 485; Notes, p. 162). Canton (1933), Coventry (*Clark*, 1933), Durham (1932), East Haddam (1933), Franklin (1932), Hamden (*Mrs. Black & Mrs. Hobbs*, 1933), Harwinton (1933), Killingworth (1933), Portland (1933), Stafford (1932), Voluntown (1933), and Watertown (1933).

Cladonia pityrea var. Zwackhii f. squamulifera Vainio (p. 485; Notes, p. 162). Colchester (1932) and East Haddam (1933).

Group Foliosae

Cladonia strepsilis (Ach.) Vainio (p. 487; Notes, p. 162). Burlington (1933), Canton (1933), Franklin (1932), Guilford (1932), Hamden (*Mrs. Black*, 1933), Hebron (1933), Middletown (1932), and Portland (1932). Most of these records are based on sterile specimens.

Cladonia strepsilis f. glabrata Vainio (p. 488; Notes, p. 163). Avon (1933), Canton (1933), Cheshire (1932), Franklin (1932), Griswold (1933), Killingworth (1932), Meriden (1933), and Pomfret (*Mrs. Paine*, 1933).

Cladonia strepsilis f. coralloidea (Ach.) Vainio (p. 489; Notes, p. 163). Avon (1933), Canton (1933), Cheshire (1932), Griswold (1933), Killingworth (1932), Wallingford (1932), and Willington (1932).

Cladonia strepsilis f. subsessilis Vainio (p. 489). Wallingford (1932).

Cladonia strepsilis f. megaphyllina Harm. (Notes, p. 163). Branford (1932), Guilford (1932), and Milford (1932).

Group Ochroleucae

Cladonia piedmontensis Merrill f. obconica Robbins (p. 491; Notes, p. 163). East Haddam (1933), Madison (1933), and Voluntown (1933).

Cladonia piedmontensis f. squamulosa Robbins (p. 491; Notes, p. 163). Durham (1932), East Haddam (1933), Madison (1933), Milford (1932), and Voluntown (1933).

Cladonia piedmontensis f. squamosissima Robbins (Notes, p. 164). Madison (1933).

Cladonia piedmontensis f. *lepidifera* (Vainio) Robbins (p. 491; Notes, p. 164). Durham (1932), Milford (1932), Pomfret (*Mrs. Paine*, 1933), and Wolcott (1933).

*Cladonia piedmontensis Merrill f. epiphylla Robbins, Rhodora **31**: 104. 1929. On earth in an old field, Milford (1932).

The apothecia in f. *epiphylla* are not borne on distinct podetia but are either sessile or short-stipitate on the primary squamules, arising from the upper surface or from the margin. The form is a homologue of the epiphyllous forms found in *C. clavulifera*, *C. subcariosa*, and other species.

At the close of 1931 (see Notes, p. 164) collections of Cladoniae had been made in 99 of the towns of Connecticut. During the years 1932 and 1933 collections were made in 20 additional towns, thus increasing the total number to 119 and reducing the number of towns still to be heard from to 50. It is hoped that this number may be still further decreased.

At the close of 1931 the number of towns to each of which 16 or more species of Cladonia had been accredited totaled 23. This number has now been increased to 39. The town standing at the head of the list is Madison, in which 37 species have been collected. This is closely followed by Killingworth, with 35 species to its credit, and North Branford, with 34. The other towns, each with 25 or more species, are the following: Old Saybrook, with 32; East Hampton and North Haven, with 28 each; Canton and North Canaan, with 27 each; and Wallingford, with 26. It will be remembered that North Canaan headed the list at the close of 1928 and North Branford at the close of 1931.

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Uvularia perfoliata in Louisiana.—In a recent study of the genus *Uvularia* (Anderson and Whittaker, in Journal of Arnold Arboretum, 15: 28–42. 1934) the junior author of this note came across a record of *Uvularia perfoliata* in northern Louisiana. Since this was over five hundred miles beyond the western limit of its previously known range, it was thought worth while to examine the specimen critically to verify the determination. The specimen, which was kindly lent us for study by Dr. J. M. Greenman, curator of the herbarium of the Missouri Botanical Garden, where it was deposited, was collected at Natchitoches, La., *E. J. Palmer*, no. 7399, April 24, 1915. The plant has immature fruit.

Range of Uvularia perfoliata (circles) and of Uvularia grandiflora (solid dots). X indicates westward extension of range of former species.

Although differing in slight details from specimens collected in the east, there can be no doubt that it belongs to this species, and it can scarcely be considered as even varietally distinct. There are four leaves below the fertile branch, which although unusual, is not unknown. The plants are also slightly shorter than in most collections from the northern and eastern states, although a few others collected along the border of the range show a similar tendency.

The region about Natchitoches is one of low hills dissected by creeks and bayous. The Uvularia was growing on a slope in upland woods in sandy soil enriched with humus, and in association with such other plants of rather northern range as *Erythronium americanum, Claytonia virginica, Dentaria laciniata, Cardamine pennsylvanica* and *Viola papilionacea.*

It is interesting to note that although this record extends the range of the species so much farther west and beyond the Mississippi River, it is still found within the same belt, between the piedmont and the low coastal plain, which it mainly follows around the eastern and southern sides of the continent, although extending somewhat further inland along the Great Lakes.—ERNEST J. PALMER and EDGAR ANDERSON, Arnold Arboretum.

A MUTATION IN RUBUS PARVIFLORUS[1]

FREDERICK J. HERMANN

Plate 326

OF THE three thornless, simple-leaved species of Rubus in eastern North America, the two shrubby species, *Rubus odoratus* L. and *R. parviflorus* Nutt. (§ *Anoplobatus* Focke, accorded generic status by Necker[2] as *Bossekia* and by Rydberg[3] as *Rubacer*) occur in Michigan. Beal's statement[4] of the distribution of the former species in the State is somewhat ambiguous. He refers to it as occurring throughout Michigan ("so far as known"), states that it is known from Ft. Gratiot (St. Clair Co.) northward, is common in the Upper Peninsula and in the Lower Peninsula north of Houghton Lake but that it has not been observed in the region south of this lake. It is represented

[1] Papers from the Department of Botany and Herbarium of the University of Michigan. no. 463.

[2] Necker; Elem. **2**:91. 1790.

[3] Rydberg, Bull. Torr. Bot. Club **30**:274. 1903.

[4] Beal, Michighn Flora, 87 (1904).

in the University of Michigan Herbarium from St. Clair, Osceola and Presque Isle Counties. If it occurs as far north as Houghton and Keweenaw Counties it must be a rarity there since the writer during several years of botanizing in these counties has never detected it. It is primarily an eastern species ranging from Nova Scotia to Georgia and apparently reaching in Michigan the western limit of its range.

The eastern limit of the range of its nearest relative, *Rubus parviflorus,* coincides approximately with the western limit of *R. odoratus.* It occurs sparingly in western Ontario, becomes more common northward and westward through Michigan and Minnesota, and is a plentiful species from the Rockies to the Pacific coast. Beal gives Elk Rapids (Grand Traverse Co.) as its southermost station in Michigan and states that it is frequent at Petoskey (Emmet Co.) and common farther north. In the University of Michigan Herbarium it is represented from Presque Isle, Emmet, Mackinac, Menominee, Marquette, Baraga, Ontonogon, Houghton and Keweenaw Counties. In Houghton and Keweenaw Counties it is a familiar sight. Indeed, one seldom enters a grove there where the characteristic fragrance of its glandular stems may not be detected. Here it is known as "Thimbleberry," and its delicious fruit, the most prized of the native "berries" belies the derogatory terms of the manuals ("insipid," "scarcely edible,") so indiscriminately applied to it throughout its range. The disparaging adjectives are appropriate only for the fruit of the plant in the West (the "salmon berry") which rarely has sufficient moisture to develop more than a cluster of dry drupes.

These two plants, with the western *R. deliciosus* James and *R. Chamaemorus* L., are markedly in contrast with their North American congeners in being hemicryptophytes and in normally lacking the compound leaves so characteristic of the other species of the genus. The writer has been familiar for many years with *R. parviflorus* in the two northernmost counties of Michigan, where it is a dominant undershrub in vast stretches of coniferous and hardwood forest, and in the aspen and spruce zones of the Rocky Mountains, the Cascades and Sierra Nevadas. Its large, simple, five-lobed or -angled leaves display so little variation in outline that it was a decided surprise to come upon a plant, amid a large colony of the typical plant, near Agate Harbor, Keweenaw Co., Michigan, which possessed only palmately-compound leaves with the leaflets deeply lobed and incised. In all other vegetative characters the plant resembled the typical form. It was not in flower or fruit. Since the occurrence of such sporadic

mutations seems to be frequently induced by some injury to the plant,[1] the compound-leaved Rubus was carefully examined for evidence of injury but none, superficial at least, could be detected. An intensive search through a large part of the colony failed to reveal any further mutations.

This very distinctive form of the "thimbleberry" may be known as

RUBUS PARVIFLORUS Nutt., forma **pedatifidus**, forma nov. (PL. 0, FIG. 2) laminis foliorum palmato-compositis, segmentis valde lobatis incisisque.—MICHIGAN: edge of abandoned road in spruce woods near Silver Isle, west of Agate Harbor, Keweenaw County, August 26, 1928, *F. J. Hermann*, no. 2188 (TYPE in Herbarium of the University of Michigan).

UNIVERSITY OF MICHIGAN.

EXPLANATION OF PLATE 326

FIG. 1. RUBUS PARVIFLORUS Nutt. Typical form (*F. J. Hermann*, no. 2187) from the same locality as the plant of fig. 2. FIG. 2. RUBUS PARVIFLORUS Nutt., f. PEDATIFIDUS, forma nov. (TYPE, *F. J. Hermann*, no. 2188).

A NEW SPECIES OF NEUROLAENA FROM BRITISH HONDURAS

B. L. ROBINSON

THE small tropical American genus *Neurolaena*, belonging in the *Senecio* tribe of the *Compositae*, may within this group be pretty readily distinguished by its 3–5-seriate involucre, homogamous heads and chaffy receptacle. The species at first appear to be, and often in fact are reported as, herbaceous plants, but they frequently attain considerable height (3–6 m.) and the stems become at least softly woody toward the base. They are often rather stately plants with conspicuous corymbs of golden yellow or greenish yellow flowers.

The late Dr. Rydberg, when treating *Neurolaena* for the North American Flora, recognized five species. One of these, namely *N. lobata* (L.) R. Br., is of rather wide tropical dispersal, occurring from southern Mexico and many of the West Indian Islands to Dutch Guiana and southward to Peru. It seems to be rather common and is often included in the gatherings of collectors making their first journeys to tropical America. Notwithstanding its yellow flowers and chaffy disk it is frequently taken for a *Eupatorium*. Indeed, it

[1] Cf., for example, Fernald & Harris on *Polygonatum pubescens*, forma *fultius*, RHODORA 35: 405. 1933.

was twice so described by Dr. F. W. Klatt, first as *E. Valverdianum* and later as *E. chrysocephalum*, the latter being a name omitted by Dr. Rydberg from his otherwise excellent synonymy.

The other species of *Neurolaena*, as recognized by Rydberg, are all very local plants of southeastern Mexico and Guatemala, three of them being known as yet from single stations only. To this group of highly localized species there may now be added another, from British Honduras, which may be put on record, as follows:

Neurolaena **Schippii**, spec. nov., fruticosa robusta usque ad 2.7 m. alta dense sordideque puberula post exsiccationem atro-olivacea; caule valde angulato albo-medulloso ad basin versus ca. 4 cm. crasso; foliis alternis breviter petiolatis oblongo-lanceolatis acuminatis cuspidato-denticulatis, ad basin versus attenuatis, penni-veniis, supra scabrido-hirtellis, subtus reticulato-venulosis molliter sordideque pilosulis; foliis inferioribus, ut dicitur, magnis usque ad 4.5 dm. longis et 2.2 dm. latis; superioribus (solis ab auctore visis) minoribus pro portione angustioribus (saepe quadrifariam longioribus quam latis); petiolo gracili ca. 1 cm. longo; panicula corymbosa composita alterniramea convexa 2.5 dm. diametro; bracteis parvis filiformi-linearibus; pedicellis plerisque 2–3 cm. longis; capitulis numerosis, pro genere magnis et multiflosculosis 1.3 cm. altis 1.5–2 cm. diametro; involucri squamis 4(–5)-seriatim imbricatis et regulariter gradatis, extimis brevibus lanceolatis acuminatis herbaceis dorso griseo-puberulis, intermediis ovato-lanceolatis vel ovatis acutis vel acutiusculis subherbaceis post exsiccationem fusco-olivaceis dorso subglabris striatis margine pallidioribus, intimis oblongis vel oblongo-linearibus abrupte acutatis vel saltim ad apicem versus angustatis flavescentibus; paleis disci linearibus ca. 1 cm. longis ad apicem triangularem primo incurvis; corollis graciliter tubulatis sine faucibus distinctis, dentibus limbi ca. 0.6 mm. longis; achaeniis (immaturis) 1 mm. longis; pappi setis ca. 65 tenuiter capillaribus brunnescenti-albis 7 mm. longis.—British Honduras: forest shade, Camp 32 of British Honduras-Guatemala Survey, alt. about 730 m., March 26, 1934, *Schipp*, no. S-735 (type, in Gray Herbarium). Said to be very rare even at the single station where obtained.

It is a pleasure to name this interesting novelty for its discoverer, Mr. William A. Schipp, who by diligent exploration and copious collections has done much to further knowledge of the vegetation to be found in the picturesque but rarely visited land where for some years he has been situated.

N. Schippii appears to be most closely related to *N. macrocephala* Sch.-Bip. of Vera Cruz, but that has quite a different involucre, in which there is a rather sudden transition from the few outermost phyllaries of calyculate nature to the very broad obtuse, round-tipped

or even subtruncate intermediate and inner ones, while as already indicated the transition in *N. Schippii* is regularly graduated and the inner phyllaries either somewhat pointed or at least perceptibly narrowed at the tip. From the other species of the genus, *N. Schippii* should be readily distinguished by its large and very numerously flowered heads.

GRAY HERBARIUM.

EVOLVULUS PILOSUS AN INVALID NAME.—In the latest monograph of the genus *Evolvulus* by Mr. S. J. van Ooststroom, the name *E. pilosus* Nutt. is brought forward for the species hitherto known as *E. argenteus* Pursh. The latter name, according to the International Rules as adopted by the Botanical Congress in Cambridge is invalidated by the earlier *E. argenteus* R. Br.; but, is not *E. pilosus* Nutt. also invalid? The name was first published by Nuttall, Gen. N. Am. Pl. i. 174 (1818), in synonymy, and later, Trans. Amer. Phil. Soc. v. 195 (1837), as a valid name. Unfortunately, at that time *E. pilosus* was already pre-empted by Roxburgh, Fl. Ind. ii. 106 (1832). In view of this, it appears that the valid name for the species in question is *E. Nuttallianus* Schultes, Syst. Veg. vi. 198 (1820).

I am indebted to Mr. C. A. Weatherby for checking this matter with me.—LILY M. PERRY, Sweet Briar College, Sweet Briar, Virginia.

SOME OBSERVATIONS ON THE FLORA OF THE BRUCE PENINSULA, ONTARIO

G. L. STEBBINS JR.

THE Bruce Peninsula, that narrow promontory of limestone separating Lake Huron from the southern part of Georgian Bay, has long been known for the wealth of its flora, and for a number of isolated species of western range found there. With these attractions in view, Mr. James Stauffer and the writer led a group of five Colgate students, J. R. Breed, H. Jeffrey, P. H. Jenkins, J. E. Loveless, and S. K. Phillips, on a field trip to this region, in order to become acquainted with its flora and to collect such of the rarer species as could be found.

On June 13, 1933 we made our first camp on Isaac Lake, in the settled farm lands of the interior of the peninsula. The borders of

this lake were lined with a fine blue flag with glaucous foliage, which looked different from the familiar *Iris versicolor*. This later proved to be the first find of the trip, *I. virginica,* here 175 miles northeast of its previously known range in Ontario.

The next day we went to Cape Croker, on the eastern side of the peninsula, for a day's collecting, which introduced us to many of the beauties of the region's flora, but yielded nothing not already known from, or to be expected from this region. After a day's rest, we moved to Red Bay, on the western shore. The marl bogs, gravelly shores, and open swales of this region, although already well known to botanists, gave us many thrills in the form of striking plants unfamiliar to us, and occupied us for the next week. Here we first noticed one of the most interesting features of the Bruce; plants characteristic of widely separated regions here grow side by side in the same habitat. The woods in the interior are Alleghenian in character, and not much different from those familiar to us in central New York. Beech and sugar maple, basswood and hop hornbeam are the cover for such herbs as *Hydrophyllum virginianum, Uvularia grandiflora,* and *Osmorhiza Claytoni.* Yet in the midst of this assemblage of familiar plants was the Cordilleran *Osmorhiza divaricata,* abundant, and just as much at home as its more southern relative. Between these woods and the shore is a more or less narrow belt of Canadian woodland, in which *Thuja occidentalis, Picea glauca, Betula papyrifera,* and *Populus tacamahacca* are dominant, along with such characteristic Canadian herbs as *Listera cordata, Habenaria obtusata,* and *Viola nephrophylla,* but containing also the Alleghenian *Senecio obovatus,* and the Cordilleran *Festuca occidentalis, Carex Richardsonii,* and *Corallorrhiza striata.* The shoreward side of these woods is interspersed with marl and sphagnum bogs, containing a large number of Hudsonian types, such as *Carex capillaris, Drosera linearis, Selaginella selaginoides,* and *Carex gynocrates,* but open swales, containing such species as *Cacalia tuberosa,* characteristic of wet prairies in the central states, are scattered through this same region. Likewise, along the shore itself, *Houstonia ciliolata,* characteristic of the upper Mississippi Valley, was at home with the boreal *Pinguicula vulgaris, Primula intercedens,* and *Carex scirpoidea.*

On June 20 we made a trip northward, following the eastern side of the peninsula, through burned-over limestone barrens of a most desolate nature, as far as Gillie's Lake, north of the small village of Dyer's Bay. The country about the western end of this lake was as

unpromising as that which we had been passing through, but we were assured by campers who had chosen this secluded but rather inhospitable spot in which to spend their vacation that the other end, five miles away, was surrounded by fine woods. This we had to reach by another road, which became so bad that only half of the party considered it worth while following. Three of us, however, persisted to the end of the road, where we found good woods, as we had been promised, again filled with Alleghenian types common in central New York. The shores of the lake were as uninteresting at this end as at the other, but a walk of a few hundred yards brought us to the shore of Georgian Bay, edged with limestone cliffs which continue in almost unbroken sequence along the entire east side of the peninsula. Here, as in most places, they had been burned over and looked hopelessly dry, but, nevertheless, a few minutes search revealed enough to repay us for our trip. *Antennaria Farwellii,* previously known only from northern Michigan, was on the gravelly bank which we descended to reach the shore; *Asplenium cryptolepis,* the first station on the mainland of Ontario, on the boulders at the foot of the cliffs; while the ledges themselves were covered with *Draba lanceolata* and *Pellaea glabella.* Two of the clumps of *Pellaea* looked more luxuriant than the rest, hanging over an almost inaccessible ledge in a tantalizing manner. Resolved to get them, I climbed carefully to the ledge above, clung with one hand to a welcome cedar branch, and with the other was just able to reach the nearest of the two. This was fortunate enough, for it proved to be true *P. atropurpurea,* the first station in Ontario. This species, so characteristic of the southern Appalachians and the central Mississippi Valley, was on the same ledge with *Draba lanceolata,* here very near the southern limit of its range, affording another of the striking associations of boreal and southern types so characteristic of this peninsula.

On returning to Red Bay, we learned that Stauffer's group had found good hunting under a high, overhanging cliff which we had noticed on the trip up, about three or four miles north of Lion's Head. Here, in one of the few spots unspoiled by fire, they had also found *Pellaea atropurpurea* and *Draba lanceolata,* and in addition, a peculiar, dwarf *Epilobium* which was nowhere near anything in the manuals. This was later identified by Professor Fernald as *E. leptocarpum* Haussk. var. *Macounii* Trel., a species of Athabasca and the Canadian Northwest, known previously in eastern America only from Newfoundland.[1]

[1] Fernald, M. L. Rhodora 28: 218. 1926

Our third stopping place was Barrow Bay, on the east side of the peninsula, where we vainly tried to find another spot along the cliffs which was not burnt over. For the most part, we could only guess at what rarities had existed on these cliffs before the fires came, and be content with such species as *Trisetum spicatum* var. *molle*, *Arabis brachycarpa*, and *Cryptogramma Stelleri* in great profusion.

On the last day of our trip, June 26, an excursion to Tobermory and Flowerpot Island enabled us to see the northwestern tip of the peninsula. The twenty mile stretch between McIver and Tobermory was the wildest country we had seen on the peninsula, and offered a new group of plants. Here the contrast between boreal and southern types in the same association was made still more remarkable by the presence of calciphiles and acid loving plants, both equally at home. Limestone barrens covered with *Pinus Banksiana* and *P. resinosa* supported *Danthonia spicata*, *Arctostaphylos Uva-ursi* var. *coactilis*, and *Coreopsis lanceolata*, along with such marked calciphiles as *Anemone multifida* var. *hudsoniana*, *Habenaria unalascensis*, *Senecio obovatus*, and *Asplenium viride*, in great luxuriance in the crevices.

Although our visit to Flowerpot Island was brief, we had time to discover its specialty, *Asplenium cryptolepis*, at one of the stations described by Saunders.[1] Here the writer was astonished to find that the chief companion of this Alleghenian fern on a large boulder was *Poa alpina*, here at its southernmost station in the east.

In going over our collections, I have noticed that the flora of the region includes six different groups of species, each characterized by a different geographic distribution. These are (1) species characteristic of the Rocky Mountains and the Canadian Northwest, which either reach their eastern limit on this peninsula, or are rare and local eastward, except in the region about the Gulf of St. Lawrence; (2) species characteristic of the Central States, particularly the upper Mississippi Valley; (3) species characteristic of the Alleghenian region, with a few typical of the Atlantic Coastal Plain, here at or near the northern limit of their range; (4) species characteristic of northern Canada, and for the most part general circumpolar types, here at or near their southern limit; (5) species endemic to the upper Great Lakes region, and (6) species characteristic of the Canadian flora. These groups will be considered in turn, with lists of the most interesting species that compose them, including the localities at which each species was seen by our party. Most of them are already known from the penin-

[1] Saunders, W. E. Ferns by the Georgian Bay. Am. Fern Jour. **19**: 49–51. 1929.

sula through the collections and writings of Macoun,[1] Klugh,[2] Saunders (l. c.) Morris and Eames,[3] Fassett,[4] and others. A few species of considerable interest which we did not see are included, these being in brackets.

Rocky Mountain Types. These comprise the most unusual element in the flora of the region, which has made it famous botanically. They include the following:

[Cryptogramma densa (Brack.) Diels.] Durham, Grey county, about fifty miles south of the Bruce proper. Not collected in recent years, but should be looked for on the unburned spots along the east side of the peninsula.

Festuca occidentalis Hook. Abundant in damp woods, Red Bay and Oliphant, where first noted by Klugh.

[Bromelica Smithii (Porter) Farwell.] Found by Klugh in rich woods on the eastern side of the peninsula, but not seen by our party.

Carex Richardsonii R. Br. Abundant in open woods near the shore, in both dry and damp places, and occasionally entering the marl bogs.

The distribution of this sedge, as described by Fernald,[5] seems to the writer good evidence that it, along with others of the species here listed, has migrated eastward in post-glacial times, following near the front of the retreating ice sheet, a belief which will be discussed more fully below. Widespread, though local, in its western distribution, it becomes rarer and rarer eastward, with a more and more limited range north and south, until at its eastern limit there are but two widely separated stations for it, one in New York and one in Vermont. A similar range was noted by Darlington[6] for certain species of beetles, and explained on this basis. Darlington observed also that these post-glacial migrants from the west are found, "in the east, almost entirely upon recently glaciated territory." In Wisconsin, where the extent of the last ice sheet is well known, the distribution of

[1] Macoun, John, and Gibson, J. Synopsis of the Flora of the Valley of the St. Lawrence and the Great Lakes with descriptions of the rarer plants. Can. Jour. (II) **14**. 1877.

[2] Klugh, A. B. Plant Formations of the Bruce Peninsula. Ont. Nat. Sci. Bull. no. 7: 10–21. 1911.

[3] Morris, F. and Eames, E. A. Our Wild Orchids. 1929.

[4] Fassett, N. C. Notes from the Herbarium of the University of Wisconsin. Rhodora **35**: 387–391. 1933.

[5] Fernald, M. L. Carex Richardsonii in New England. Rhodora **34**: 229–232. 1932.

[6] Darlington, P. J. The Cicindelid and Carabid beetles of Central New Hampshire with Special Reference to the Geographical Relationships of the Mountain Fauna. Diss. Harvard University; cf. Harvard University, summaries of Ph.D. Theses, 1931. p. 22.

Carex Richardsonii was noted by Wadmond.[1] The three stations listed by him are scattered through the southeastern part of the state, which was covered by the Wisconsin ice sheet, but none are in the famous driftless area of southwestern Wisconsin. On the Bruce Peninsula, where the western species are a well marked element in the flora, *Carex Richardsonii* is not rare, but in its abundance in some parts of the Canadian woodland suggested to the writer the aspect of *C. novae-angliae* in northern, and *C. pennsylvanica* in southern New England.

HABENARIA UNALASCENSIS (Spreng.) Wats. Lion's Head; southeast of Gillie's Lake; north of McIver; Flowerpot Island. Immature plants, probably of this species, were seen at Red Bay.

With the exception of the first, called to my attention by W. R. Watson, these are all, so far as I can determine from available records, new stations, and indicate the widespread distribution of this species on the peninsula. Except on Flowerpot Island, it was found in second or third growth woodland, mostly of scrubby poplars, birches, and balsam fir, and it is apparently aggressive enough to enter regularly into burned or cut-over areas.

EPIPACTIS DECIPIENS (Hook.) Ames. Flowerpot Island.

Plants immature, but undoubtedly of this species, the abundance and luxuriance of which on the peninsula has been vividly described by Morris and Eames.

CORALLORRHIZA STRIATA Lindl. Abundant and well known from the woods about Howdenvale, Red Bay, and elsewhere.

EPILOBIUM LEPTOCARPUM Haussk. var. MACOUNII Trel. (Det. M. L. Fernald.) Damp, shaded boulders under cliffs, north of Lion's Head.

As noted above, this species is not known elsewhere east of Athabasca except in Newfoundland.

[E. PANICULATUM Nutt.] Bruce Peninsula, Macoun; Barrow Bay, Fassett. Not seen by our party.

OSMORHIZA DIVARICATA Nutt. Abundant in woods, Red Bay; Oliphant; Flowerpot Island.

Fassett notes that this species is common in other areas of the Great Lakes region.

Most of these species are found in other localities in the region about the upper Great Lakes, such as northern Michigan and the north shore of Lake Superior, but the majority reach their eastern limit on or near the Bruce, except for their occurrence about the Gulf of St.

[1] Wadmond, S. C. Notes from Southeastern Wisconsin. RHODORA 35: p. 253. 1933.

Lawrence, in or near areas not covered by the last, or Wisconsin glaciation. Since in these latter regions they are, as Fernald[1] has so clearly pointed out, relics of a preglacial flora, the question has naturally arisen as to whether this is also true of their occurrence in the Great Lakes region. That most, if not all, of the Bruce Peninsula has at some time been occupied by an ice sheet was the opinion of our party, although we were not qualified to judge the age of the glaciation. There may be areas which were covered only by pre-Wisconsin ice-sheets, on which relic species could have persisted throughout the time of the Wisconsin glaciation.[2] Fernald's suggestion (l. c. pp. 317–318) that these western species existed in the unglaciated region of Wisconsin and the neighboring states during the Wisconsin glaciation, and migrated out from there in post-glacial time is considered improbable by Fassett.[3] Another possibility is that an unglaciated area, as yet not recognized, exists on the north shore of Lake Superior or Lake Huron, or in northern Michigan. The fourth possibility is the suggestion of Fernald (l. c. p. 292) that some of these species might have migrated eastward from the Rocky Mountains in post-glacial time. This seems to the writer the most likely one for those western species which are widespread in the upper Great Lakes region.

Their present absence from most of the territory between the Great Lakes and the Rocky Mountain region could be explained by the disappearance of the woods from this region, with the advent of a warmer, drier climate. Evidence that extensive woodland existed in what is now the prairie region of Nebraska is given by Bowman.[4]

That the Bruce Peninsula is the eastern limit of this post-glacial migration for all except two or three species could be explained by the fact that the limestone strata which produce the favorable soil for most of these plants turn sharply southward at this point, and that the region to the eastward is underlain for the most part by silicious rock, supporting a sterile, acid soil, quite unfavorable to most of the species of this list, and blocking effectively their migration eastward. Their progress southward was undoubtedly blocked by competition with the aggressive Canadian and Alleghenian species migrating

[1] Fernald, M. L. Persistence of Plants in Unglaciated Areas of Boreal America. Mem. Am. Acad. 15. 1925.

[2] Since this article went to press, Dr. Fernald (in lit.) has called to the writer's attention Prof. A. P. Coleman's conclusion that such areas exist. Nevertheless, it seems unlikely that these nunataks were large enough to support a Canadian woodland flora, which would include such species as those mentioned above.

[3] Fassett, N. C. Notes from the Herbarium of the University of Wisconsin, Rhodora 33: 224–228. 1931.

[4] Bowman, I. Forest Physiography, p. 428. 1911.

northward along these same limestone strata. Significantly, the only species found to the eastward, except in the Gulf of St. Lawrence region, are *Epipactis decipiens*, which is "found chiefly on granites and schists" (Fernald l. c. p. 288), *Corallorrhiza striata*, a saprophyte, and hence comparatively independent of soil conditions, and *Carex Richardsonii*, excessively rare southeast, but not found east or northeast, of this peninsula. Furthermore, these ten species which occur at the eastern limit of the upper Great Lakes region are all equipped with efficient means of dispersal, either by wind (*Cryptogramma densa* with light spores; *Habenaria unalascensis*, *Epipactis decipiens*, and *Corallorrhiza striata* with light, wind-blown seeds; the species of *Epilobium* with comose seeds); or by animals (***Festuca occidentalis*** and *Bromelica Smithii* with awned florets, *Carex Richardsonii* with rough pubescent perigynia, *Osmorhiza divaricata* with bristly fruits) and could therefore be expected to migrate rapidly.

Plants characteristic of the Central States, particularly the upper Mississippi Valley, include the following:

Iris virginica L. Borders of Isaac Lake and Sky Lake. Determination verified by Dr. Edgar Anderson.

The fact that the two lakes beside which this Iris occurs in great abundance are surrounded by old lake terraces twenty or thirty feet above their present level, and may once have been part of a bay of Lake Huron, recalls the distribution of this species in northern Michigan, as recorded by Anderson,[1] where it is practically confined to old lake basins.

Arenaria stricta Michx. Very abundant on limestone barrens, Oliphant; Red Bay; Howdenvale; Pike Bay; and elsewhere. Growing in exposed situations is a form with short leaves and dense cymes which approaches the southwestern var. *texana* Robinson.

Astragalus neglectus (T. & G.) Sheldon. Common in gravelly thickets on Cape Croker, and on the limestone barrens about Gillie's Lake and McIver. First noted by Macoun.

Ceanothus ovatus Desf. Limestone barrens south of Gillie's Lake; between McIver and Tobermory. The Bruce Peninsula specimens approach var. *pubescens* T. & G. of the central states.

[Lithospermum Gmelini (Michx.) Hitchc.] Oliphant, Morris and Eames.

Houstonia ciliolata Torr. Very common along the shore, Oliphant; Red Bay; and Howdenvale.

[1] Anderson, E. A. The Distribution of Iris versicolor in Relation to the Post Glacial Great Lakes. Rhodora 35: 154–160. 1933.

Coreopsis lanceolata L. Limestone barrens between McIver and Tobermory.

C. lanceolata var. villosa Michx. With the typical form, near McIver.

The range of this variety, as stated in Gray's Manual, 7th edition, is "Ill. and Mo. to Fla.," considerably southwest of the Bruce Peninsula.

Achillea Millefolium L. var. lanulosa (Nutt.) Piper. Shore of Flowerpot Island, where unquestionably native.

Cacalia tuberosa Nutt. Wet swales, Oliphant and Red Bay.

Most of these species are characteristic of the open swales and wet shores of the southwestern part of the peninsula, and undoubtedly reached it by northward migration along the shore of Lake Huron.

The Alleghenian types form the dominant vegetation in much of the interior of the peninsula. Most of them are common in Ontario, and range somewhat north of the Bruce Peninsula, but a few, of a more southerly range, are listed here.

Pellaea atropurpurea (L.) Link. Cliffs facing Georgian Bay, north of Dyer's Bay; cliffs north of Lion's Head.

The first records for this species in Ontario (fide T. M. C. Taylor in litt.), although its close relative, *P. glabella* Mett., is common in suitable places.

Asplenium cryptolepis Fernald. To the stations already known on Manitoulin and Flowerpot Islands may be added: boulders at foot of cliffs facing Georgian Bay, north of Dyer's Bay; cliff crests south of Lion's Head. It is very likely scattered all along the cliffs on the eastern side of the peninsula.

Sisyrinchium mucronatum Michx. Abundant along the shore, Cape Croker; Red Bay; and Oliphant.

[Scleria verticillata Muhl.] Oliphant. Klugh.

Silene antirrhina L. Cape Croker.

Senecio obovatus Muhl. Damp woods, Oliphant; Red Bay; Howdenvale; also abundant on limestone barrens throughout the north end of the peninsula.

The woodland form blooms later than that on the barrens, and has larger, more coarsely crenate leaves.

These species must have migrated into the peninsula from the south, following in general the line of the Niagara escarpment.

The species endemic to the Great Lakes region were few. These were:

Iris lacustris Nutt. Very abundant in damp woods and open places along the west shore of the peninsula.

Primula intercedens Fernald. Common in crevices and gravelly hollows along the west shore. Very variable, and in shaded or damp places apparently intergrading with *P. mistassinica.*

Antennaria Farwellii Greene. Gravelly bank near shore of Georgian Bay, north of Dyer's Bay.

The specimens are a good match for the type material from northern Michigan. This rather striking species should be looked for elsewhere in the region about the upper Great Lakes. Its long-petioled, rather distinctly three-nerved leaves, and large (about 9 mm. high) involucres with broad, petaloid bracts serve to distinguish it from *A. neodioica* var. *grandis*, which it resembles most closely. Its involucre resembles those of *A. occidentalis* and *A. petaloidea*, but it is distinguished from both of these species by its short, erect stolons and by the shape of its leaves. The writer has seen the following specimen from Wisconsin, which marks the western limit of its known range: dry basalt outcrop, Chittamo, Washburn County, N. C. Fassett no. 8660. Specimen in the herbarium of the University of Wisconsin.

Of these three endemic species, the first is "too close" (cf. Gray's Manual ed. 7) to the Alleghenian and Carolinian *I. cristata* Ait.; the second is a member of a polymorphic circumpolar group of species, and intergrades with the widespread Canadian *P. mistassinica* Michx.; while the third is one of a group of closely related parthenogenetic species which are dominant and widespread throughout the glaciated area of eastern America. Going through Gray's Manual and a few available later publications, the writer has found sixteen other species endemic to the Great Lakes region in general. Of these, ten belong to the large, polymorphic genera *Sisyrinchium*, *Ribes*, *Crataegus*, *Rosa*, *Hypericum*, and *Solidago*, and are closely related to eastern American types. Three others, *Sisyrinchium hastile* Bicknell, *Erythronium propullans* Gray, and *Cirsium Pitcheri* (Torr.) T. & G. are most nearly related to species which occur in the same region, but whose center of distribution is the Great Plains; one, *Streptopus longipes* Fernald, is very near the Canadian *S. roseus* Michx., while the fifteenth, *Salix syrticola* Fernald, has been treated as identical with the arctic and subarctic *S. adenophylla* Hook. Only one, *Woodsia Cathcartiana* Robinson, is related to Cordilleran species. It is, moreover, of doubtful specific status,[1] belonging to a polymorphic species complex, one member of which, *W. oregana*, is found in the same region. This situation is in striking contrast to that of the numerous endemic

[1] cf. House, H. D. Am. Fern Jour. 23: 2. 1933.

species of eastern Quebec, western Newfoundland, and adjacent areas, which are for the most part very distinctive and most nearly related to Cordilleran or high arctic species. (cf. Fernald l. c. pp. 292–295.) It is further evidence that the relic flora of the Great Lakes is scanty compared to that of the now famous unglaciated regions farther east.

The plants, mostly circumpolar species, characteristic of northern Canada, which are at or near their southern limit on the Bruce, form the dominant vegetation in the open marl bogs, and are abundant also on the rocky shores of the west coast, and the cliffs of the east coast of the peninsula. The following are perhaps the most interesting.

Polystichum Lonchitis (L.) Roth. Common along the eastern side of the peninsula as far as Barrow Bay, the most northerly locality at which it was seen.

Two of the other fern specialties of the region, *Thelypteris Filix-mas* and *Scolopendrium vulgare*, were noted at Sidney Bay, Cape Croker, but not farther north.

Asplenium viride L. Limestone barrens, McIver. Found by Saunders and others in many other localities on the peninsula.

Selaginella selaginoïdes (L.) Link. Marl bogs, Red Bay and Oliphant.

Poa alpina L. Flowerpot Island.

Poa sp. Boulders at foot of cliffs, south of Lion's Head.

A species related to *P. glauca*, but with large spikelets, 6–8 mm. long, and the lemmas pubescent below. This is a member of a boreal and Cordilleran group, and may represent another isolated occurrence on the Bruce, but on account of the systematic confusion within the genus it could not be satisfactorily identified.

Agropyron trachycaulum (Link) Malte var. majus (Vasey) Fernald. Cape Croker; south of Lion's Head, and elsewhere. Probably of general distribution along the east side of the peninsula.

Carex scirpoidea Michx. Common in woods and open places near the shore, Red Bay and Oliphant.

C. capillaris L. Abundant on borders of marl bogs, Red Bay and Oliphant.

C. gynocrates Wormsk. Center of marl bogs, Red Bay and Oliphant.

C. livida (Wahlenb.) Willd. var. Grayana (Dewey) Fernald. Marl bog, Oliphant.

Draba lanceolata Royle. Cliffs, north of Dyer's Bay; north and south of Lion's Head; Barrow Bay. Reported from the latter locality (as *D. cana*) by Fassett. Apparently general along the cliffs of the eastern shore.

Arabis brachycarpa (T. & G.) Britton. Barrow Bay.

Drosera linearis Goldie. Open marl bogs, Red Bay and Oliphant.

Potentilla norvegica L. var. labradorica (Lehm.) Fernald. Specimens from crevices in rocks, Round Island, Fishing Islands, are close to this variety (fide M. L. Fernald.)

Senecio pauperculus Michx. The typical form is abundant in exposed places along the shore, Red Bay and Oliphant; and was seen also south of Lion's Head and on Flowerpot Island. Var. *Balsamitae* (Muhl.) Fernald is common everywhere.

Of the plants of general Canadian range, the following are worth noting as new records, to the knowledge of the writer, for the Bruce Peninsula.

Poa saltuensis Fernald and Wiegand. Rich woods, Red Bay.

Ranunculus sceleratus L. Round Island, Fishing Islands.

Sisymbrium brachycarpon Richards. Cape Croker.

Amelanchier humilis Wiegand. Cape Croker.

Convolvulus spithamaeus L. Between McIver and Tobermory.

This is the grayish pubescent form of the species, with broad involucral bracts, and is therefore close to the form referred by Wherry[1] to *C. stans* Michx.

Antennaria occidentalis Greene. Cape Croker.

A. petaloidea Fernald. Oliphant.

Specimens of every species collected have been deposited in the Colgate University Herbarium, and in the Gray Herbarium, while duplicates of most of them have been sent to the herbaria of the University of Toronto, the University of Montreal, Cornell University, and elsewhere.

The writer and his colleagues of the expedition wish to express their gratitude to Dr. Thomas M. C. Taylor, Fr. Marie-Victorin, Mr. W. E. Saunders, and Mr. W. H. Watson for helpful information concerning the region visited, to Professor M. L. Fernald, Professor K. M. Wiegand, and Dr. E. A. Anderson for their kind assistance in the identification of the specimens, and to Dr. N. C. Fassett for assistance in obtaining references to literature.[2]

Colgate University,
Hamilton, New York.

[1] Wherry, E. T. Three Shale Barren Plants of Maryland. Torreya 29: 104–107. 1929.

[2] Since this article has gone to press, I have received word that the following species of the above list, which I believed to have been collected for the first time on the peninsula, have also been found by expeditions from the University of Toronto: *Asplenium cryptolepis, Potentilla norvegica* var. *labradorica*, and *Epilobium leptocarpum* var. *Macounii.*

Sisyrinchium mucronatum in Penobscot County, Maine.—On the 18th of June, 1933, Dr. Manton Copeland of Bowdoin College, Mr. W. Dale Currier of Caribou, Maine, and the writer were passing through Winn in Penobscot County, when a delay of about ten minutes made it possible to look more carefully at the plants by the roadside near a garage at that place. Growing in shallow soil over a ledge by the east side of the road, at the edge of a wooded area, we noticed a Blue-eyed Grass unlike any of the species we had previously seen growing. It occupied an area less than twelve feet in length. Near it grew the common *Sisyrinchium angustifolium.* We took a few specimens of the stranger, leaving most of the small colony to continue its existence there. Material for a sheet sent to Dr. M. L. Fernald has been identified by him as *Sisyrinchium mucronatum* Michx.

In December Dr. Fernald wrote, "it is the first evidence of the species from east of the Connecticut Valley. In this jump to north-central and eastern Maine it is, therefore, like numerous other species which we already know from Aroostook County and adjacent areas."

With this interesting information before us, it is needless to state that it is an addition to the flora of Maine.—Arthur H. Norton, Museum of Natural History, Portland, Maine.

Lemna cyclostasa an Invalid Name.—In 1897, in his *North American Lemnaceae,* C. H. Thompson took up for *Lemna valdiviana* Philippi (1864) the name *L. cyclostasa,* ascribing it to "(Ell.) Chev. Fl. Par. **2**: 256. 1827. Schleid. Linnaea, **13**: 390. 1839." These citations are given in *Index Kewensis* and it seems probable that Thompson, monographing the genus, found it easier to copy from that indispensable but not infallible work than to check the publications himself. In preparing the 7th edition of Gray's Manual Dr. Robinson and I looked carefully into the matter and, as a result, maintained *L. valdiviana.* In the various works emanating from New York, Britton & Brown's Illustrated Flora, Small's Manual and Rydberg's Flora of the Prairies and Plains, the plant is still called, following *Index Kewensis* and Thompson, *L. cyclostasa* (Ell.) Chev. with the reference to vol. ii. 256 (1827).

In reviewing the group for the next edition of Gray's Manual I had again checked the matter and had retained *Lemna valdiviana* as the first valid name for the species; but the persistent acceptance of the

erroneous name by those who should know better makes it desirable to ask them to search Chevalier for any mention whatever of *L. cyclostasa*. Elliott had originally described *L. minor*, var. ? *Cyclostasa*, Ell. Sk. Bot. S. C. and Ga. ii. 518 (1824); but there was no obvious reason why Chevalier, in a flora of Paris, should discuss it, and a fourth raking of his pages shows that he did not do so! As to the reference to Schleiden given by Thompson, after *Index Kewensis*, that was merely the enumeration among the synonyms of *L. minor* of a "*L. cyclostasa* Elliot[t]." But certainly such a citation in the synonymy of *L. minor* does not constitute the publication of *L. cyclostasa* as a valid species, even though, by inference, we can associate the synonymic binomial with Elliott's variety.—M. L. Fernald.

Volume 37, no. 433, including pages 1 to 32, a portrait and plates 323 to 325, was issued 4 January, 1935.

RUBUS PARVIFLORUS (left) and forma PEDATIFIDUS (right).

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FIG. 1 (upper). ECHINOCEREUS PAPILLOSUS (left); E. ANGUSTICEPS (right).
FIG. 2 (lower). ECHINOCEREUS ANGUSTICEPS.

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ECHINOCEREUS ANGUSTICEPS, A NEW SPECIES FROM THE LOWER RIO GRANDE VALLEY, TEXAS[1]

Elzada U. Clover

Plate 327

According to Britton and Rose, *Echinocereus papillosus* A. Lke. occurs in western Texas and supposedly also in the vicinity of San Antonio. For several years it has been known in the Lower Rio Grande Valley, Texas. The first collection, which was made by the author, was in 1926, when two specimens were found five miles north of Loma de la Cruz, near Rio Grande City, Starr Co., Texas. Recent collections (*Clover* 15255 and 548) have been made ten miles west of Edinburg, Hidalgo Co., Texas, where the plant is abundant in an area at least a mile square.

This range was extended during the course of mapping Starr County. Many specimens were found near Rucio, a ranch home about fourteen miles north of Rio Grande City, and from here the plants were numerous in the brush along the Hebbronville road southward for ten miles.

The soil here is light sandy loam with some red gravel and limestone on low hills. *Echinocereus papillosus* is found growing under the shelter of shrubs or large opuntias. These low hills are covered with typical chaparral in which *Acacia amentacea, Acacia Berlandieri* and *Leucophyllum texanum* predominate. *Prosopis juliflora* (the mesquite), *Condalia obovata* and *Bumelia angustifolia* are found in this association. Other cacti occurring with *Echinocereus papillosus* are *Coryphantha*

[1] Papers from the Department of Botany and Herbarium of the University of Michigan, No. 493.

Runyonii, Lophophora Williamsii, Ancistrocactus Scheeri and *Neomammilaria hemisphaerica.*

Within the last few years a type somewhat resembling *E. papillosus* has been found in a limited area near Linn, seventeen miles north of Edinburg, Hidalgo County. It is called "The small papillosus," by nurserymen in southern Texas. It seems to have been first discovered by Mrs. Troy Downs of Alamo, Texas.

The association in which it grows is quite different from that of the larger form, and the fact that the two never occur together has significance. The soil is light sandy loam to dark loam, and the vegetation consists of scattered mesquites and grass with *Zizyphus obtusifolia, Lippia ligustrina, Karwinskia Humboldtiana, Dolicothele sphaerica, Neomammillaria hemisphaerica, Hamatocactus setispinus* and *Jatropha spathulata.*

Although many of the species of this association are also found in the habitat of *Echinocereus papillosus,* the nature of the associations is not at all alike. The cactus near Linn grows in open places with less protection than the other form gets. It differs greatly in size and habit from its relative, as Plate 327, fig. 1 will show. Specimens under observation in the Michigan Botanical Gardens (nos. 547 and 548) have been given identical conditions for two years and still retain these characteristic differences. Environmental conditions in the field do not therefore appear to be responsible for the difference in habit and form.

Both species blossom during April and May in the greenhouse, probably earlier in the field, the flowers remaining open for two or three days.

According to reports of cactus growers *Echinocereus papillosus* is more difficult to grow than the other species, for the two appear to be specifically distinct. The chief characteristics of the two types compiled from notes on many specimens are shown below in parallel columns:

Characteristics	Echinocereus papillosus	Echinocereus angusticeps
Number of stems in clump	one to nine	five to ninety-five
Diameter of largest clump	thirteen inches (nine stems)	twelve inches (ninety-five stems)
Length of stem	fifteen to seventeen cm.	four to eight cm.
Diameter of stem	five to seven cm.	two to three cm.
Number of ribs	eight to nine	seven to eight
Number of spines on rib	radial, eight to ten; central, one	radial, seven to nine; central, one

Characteristics	Echinocereus papillosus	Echinocereus angusticeps
Flower color	sulfur-yellow segments; center, nopal to brazil red	same
Width of flower	seven to nine cm.	seven to nine cm.
Length of flower	nine to nine and six-tenths cm.	eight and five-tenths to nine cm.
Series of perianth-segments	four	five
Shape of segments	oblong-spatulate, acuminate	oblong-spatulate to ovate
Apex of segment	long-apiculate	short-apiculate to blunt
Serration of segments	finely erose	deeply erose to entire
Color along middle trace of outer perianth-segment	deep hellebore red	purple-drab

The differences justify the recognition of a new species, since there should be a definite name for a plant which is known by all local cactus enthusiasts as being distinct from the one already well known as *Echinocereus papillosus.*

Echinocereus angusticeps sp. nov. (TAB. 327, FIGS. 1, dextra, et 2) caespitosus, caulibus 6–95, decumbentibus vel erectis 4–8 cm. altis, 2–3 cm. crassis; costis 6–8 rectis summitate vix spiralibus, verticaliter sinuatis, modice altis, in tuberculas fere solutis; spinis lateralibus radiatim porrectis 7–9 acicularibus, albis vel luteis, centrali solitaria, succineo-alba; areolis 1–2 mm. latis, rotundis; florentibus rotundis, spinis albis, 4–13, longissimis 6 mm. longis; floribus magnis 8.5–9 cm. longis, 7–9 cm. latis, medio rubro alibi sulfureo-luteis; segmentis perianthii 5-seriatis, exterioribus medio atropurpureis, marginibus et apice luteis, stylo viridi, stigmatis lobis 10–12; filamentis numerosis, antheris luteis, fructibus viridescentibus. Specimen typicum vivum ex loco Texensi "Linn" dicto conservatum est in Horto Botanico Universitatis Michiganensis; siccatum sub numero 15261 in Herb. Univ. Mich., Ann Arbor, Michigan.

Echinocereus angusticeps n. sp. (PLATE 327, FIGS. 1, right, and 2) caespitose, stems procumbent to ascending, several to many, 4–8 cm. long, 2–3 cm. in diameter, ribs 6–8, prominent, definitely tuberculate; radial spines 7–9, white to yellow, porrect, acicular, upper ones in each group smaller, about 4 mm. long; central spine solitary, brown, acicular, erect, 7–8 mm. long; flowers showy, delicately fragrant; perianth-segments in five rows, segments 3–4 cm. long, 1.5–2 cm. wide, sulfur-yellow, nopal to brazil red at center, the outer ones purple-drab on the outside along the middle trace, oblong-spatulate to ovate, short-apiculate to blunt, erose; scales on ovary purple-drab[1] to reddish, spines on ovary 4–13, longest 6 mm. long, white; width of flowers 7–9 cm., length of flower 8.5–9 cm., stamens cream-colored, shorter than the pistil, stigma-lobes 10–12; fruit greenish.

[1] Colors according to "Color Standards and Nomenclature," Ridgeway.

Distribution: known only from open mesquite woods, Linn, Hidalgo County, Texas (type locality).

Department of Botany, University of Michigan.

Explanation of Plate 327

Fig. 1. Echinocereus papillosus A. Lke. (Mich. Bot. Gard. No. 15255, left); Echinocereus angusticeps Clover (Mich. Bot. Gard. No. 15261, right) showing differences in size and habit.

Fig. 2. Echinocereus angusticeps Clover (Mich. Bot. Gard. No. 15261).

NOTES ON THE FLORA OF WORCESTER COUNTY, MASSACHUSETTS

David Potter and Norman P. Woodward

In the list of "The Herbaria of New England" compiled in 1901 by the late Mary A. Day[1] no herbaria are listed from Worcester County. During the years which have elapsed since the above article appeared much active botanical work has been accomplished in and about Worcester, which has resulted in the appearance of at least four small herbaria. The smallest of these is that of the late Joseph Jackson, author of "The Flora of Worcester County."[2] After the death of Mr. Jackson his herbarium became the property of Miss Ethel L. Rider, a teacher in the North High School of Worcester, Massachusetts, and is there housed. The senior author has recently examined this collection and found it to contain 713 named species and varieties, with practically no duplication. In addition there are about 30 sheets of unnamed specimens. These plants, collected between the years 1878 and 1885, are in white paper folders and for the most part unmounted. 517 of the above noted 713 plants were collected in Millbury, Massachusetts. Mr. Jackson states in the preface to his first edition that he at first planned to write only a flora of Millbury, but finally expanded it to include the whole county. This first edition contained 810 species and well marked varieties. The second edition lists 1098, while the third increased the count to 1240. A supplement to this work, by Norman P. Woodward[3] was published in 1927 adding some 421 plants new to the county, thus making the total number of species reported 1661.

[1] Day, Mary A. The Herbaria of New England. Rhodora, 3: 67–71, 206–208, 219–222, 240–244, 255–262, 281–283, 285–288.

[2] Jackson, Joseph. Flora of Worcester County, Massachusetts. Worcester Natural History Society, 1883. 2d edition, 1894, 3d edition, 1909.

[3] Additions to Flora of Worcester County. Edited by Norman P. Woodward. Worcester Natural History Society, 1927.

The Herbarium of the Worcester Natural History Society contains approximately 6280 sheets, of which 4307 are from Worcester County. This count includes only the Pteridophyta and the Spermatophyta, although the Society has a very creditable collection of both the Bryophyta and certain of the Thallophyta. Unfortunately, the herbarium is poorly housed from a standpoint of accessibility, with very limited space for work, and kept in an unheated room.

The Biology Department of Clark University has an herbarium of approximately 10,000 sheets. This collection is not restricted to the flora of Worcester County but is primarily a teaching collection. In addition to the New England material it contains 280 sheets from the Galapagos Islands, collected by Dr. Bauer in 1891, Dr. Potter's collection[1] of about 600 numbers from the region of James Bay (the southern portion of Hudson Bay) and about 700 sheets from eastern Ontario and western Quebec, in the general region from Lake Temiskaming to Lake Abitibi, collected by Mr. W. B. Brierly and Mr. W. H. Hodge.

Three years ago under the leadership of the senior author the Hadwen Botanical Club was formed. It was named in honor of Obadiah B. Hadwen, a resident of Worcester, who, at his death, bequeathed to the University his estate, the same to be used as an arboretum. The main purpose of the Club is to stimulate interest concerning plants and bring together those botanically minded people in and about Worcester who for some time have been more or less "lone-star rangers." The first problem of the Club is to make a very thorough survey of the flora of the county, and although only just past its second collecting season, the herbarium of the club now numbers approximately 3000 sheets.

Due to the Club's activity and that of those connected with the Natural History Society a number of plants new to the county have been found, and it is thought advisable to publish at this time a list of this new material. It is a pleasure to record thanks to all the people who have contributed to this work. Special thanks are due to Mrs. R. B. Dodge for her unfailing interest and careful work, to Mrs. D. L. Salter for her contributions to the families Gramineae and Cyperaceae, to Mr. Cyrus Darling for his work on the Ferns, and to Mr. Earl W. Bemis for his many valuable contributions.

The plants enumerated in the following list are arranged by families

[1] Potter, David., Plants collected in the Southern Region of James Bay. Rhodora, 36: 274–284. 1934.

according to the system used in Gray's Manual, 7th edition. In each case the species listed is accompanied by the name of the person who first discovered and reported the plant as growing within the county, the township where found, the date of finding and, where an herbarium sheet exists, its place of deposition. For this purpose the following key is used.

C. The Herbaria of Clark University and the Hadwen Botanical Club.
W. The Herbarium of the Worcester Society of Natural History.
S. The private Herbarium of Mrs. D. L. Salter, Worcester, Mass.
G. The Gray Herbarium (including the Herbarium of the New England Botanical Club) at Harvard University.

In a few cases no herbarium sheet exists, but it is the hope of the authors that these omissions will soon be rectified. It is thought best to report these plants even though the pressed specimen is lacking, since in each instance the person reporting the same is thoroughly reliable.

Polypodium virginianum L., forma elongatum (Jewell) Fernald. C. Leicester, July 15, 1933. *Cyrus Darling.*

Polystichum acrostichoides (Michx.) Schott, forma incisum (Gray) Gilbert. C. Holden, July 31, 1933. *Cyrus Darling.*

Sorghum halepense (L.) Pers. S. Hubbardston, Sept. 15, 1930. *D. L. Salter.*

Paspalum pubescens Muhl. (See Weatherby, Rh. **30**: 128). C. Westminster, Aug. 15, 1930. *C. M. Litch.* Also *D. L. Salter,* Worcester, Sept. 15, 1930.

Panicum linearifolium Scribn., var. Werneri (Scribn.) Fernald. C. Fitchburg, June 7, 1932. Rh. **36**: 65. *C. M. Litch.*

Panicum lanuginosum Elliott, var. fasciculatum (Torr.) Fernald. C. Fitchburg, June 15, 1932. *C. M. Litch.*

Panicum oligosanthes Schultes, var. Scribnerianum (Nash) Fernald. C. Fitchburg, June 7, 1932. Rh. **36**: 80. *C. M. Litch.*

Panicum Tuckermani Fernald. Rh. **21**: 110. G. Shrewsbury, Nov. 27, 1929. *Earl W. Bemis.*

Anthoxanthum odoratum L., var. villosum Loisel. G. Paxton, June 10, 1933. "Peculiar in the sessile spikes." *Earl W. Bemis.*

Sporobolus neglectus Nash. S. Worcester, Oct. 9, 1932. *D. L. Salter.*

Agrostis alba L., var. vulgaris (With.) Thurb. S. C. Worcester, July 15, 1929. *D. L. Salter.*

Deschampsia caespitosa (L.) Beauv., var. parviflora (Thuill.) Richter. W. Tatnuck, Sept. 25, 1931. *Clarence W. Kinney.* Found in garden soil. A second record for Mass.

Avena sativa L. July 9, 1927. *Norman P. Woodward.* Common

about dumps and new home sites. No herbarium sheet of the above specimen. This plant has been collected and herbarium sheets are now in the collection of the Hadwen Botanical Club from Worcester, Auburn, Millbury and Princeton.

Eragrostis pectinacea (Michx.) Steud. S. C. Holden, Aug. 5, 1928. *D. L. Salter.*

Eragrostis peregina Wiegand. S. Worcester, Sept. 15, 1930. *D. L. Salter.*

Poa nemoralis L. S. C. Worcester, June 2, 1930. *D. L. Salter.*

Poa trivialis L. S. Upton, June 20, 1931. *D. L. Salter.*

Poa alsodes Gray. S. Worcester, May, 1930. *D. L. Salter.*

Glyceria grandis Wats. S. C. W. Worcester, July 20, 1928. *D. L. Salter.*

Glyceria borealis (Nash) Batchelder. G. Boylston, July 30, 1928. *Earl W. Bemis.* Several plants in shallow water.

Festuca rubra L. S. Leicester, June 21, 1930. *D. L. Salter.*

Festuca ovina L., var. hispidula Hack. S. C. Worcester, June 20, 1928. *D. L. Salter.*

Festuca ovina L., var. capillata (Lam.) Hack. S. Worcester, June 20, 1930. *D. L. Salter.*

Bromus hordeaceus L. S. Worcester, June 20, 1932. *D. L. Salter.*

Bromus commutatus Schrad. S. C. Worcester, Aug. 1, 1929. *D. L. Salter.*

Bromus ciliatus L., var. intonsus Fernald. G. Shrewsbury, Oct. 21, 1932. *Earl W. Bemis.* The common New England form. Rh. **32**: 70.

Bromus purgans L. S. Hubbardston, August, 1929. *D. L. Salter.*

Bromus inermis Leyss. S. C. Worcester, July 4, 1930. *D. L. Salter.*

Lolium multiflorum Lam. C. W. Worcester, June 10, 1929. *D. L. Salter.*

Triticum sativum Lam. Worcester, June 22, 1929. *Norman P. Woodward.* No herbarium sheet, frequent about the city on dumps.

Cyperus rivularis Kunth. G. Boylston, Aug. 17, 1930. *Earl W. Bemis.*

Cyperus erythrorhizos Muhl. G. Boylston, Aug. 21, 1930. *Earl W. Bemis.*

Cyperus strigosus L., var. capitatus Boeckl. G. Boylston, Aug. 21, 1930. *Earl W. Bemis.*

Cyperus strigosus L., var. compositus Britton. G. Boylston, Aug. 21, 1930. *Earl W. Bemis.*

Fimbristylis Frankii Steud. G. Shrewsbury, Nov. 27, 1929. *Earl W. Bemis.*

Scirpus sylvaticus L., var. Bissellii Fernald. G. Bolton. *F. F. Forbes.* Also in Worcester by *Earl W. Bemis,* Aug. 21, 1933.

Rh. **36**: 7. *C. A. Weatherby* writes as follows: "Scirpus sylvaticus v. Bissellii . . . is always rare, but the sort of variation which I should expect to turn up now and then wherever the typical form is found."

Carex scoparia Schkuhr, var. moniliformis (Tuckerm.) Kukenth. G. Shrewsbury, June 25, 1933. *Earl W. Bemis.*

Carex scoparia Schkuhr, var. condensa Fernald. S. Worcester, June 21, 1930. *D. L. Salter.*

Carex projecta Mackenzie (*C. tribuloides* Wahlenb., var. *reducta* Bailey). G. Shrewsbury, June 20, 1933. *Earl W. Bemis.*

Carex siccata Dewey. S. Oakham, May 30, 1932. *D. L. Salter.* Also by *Earl W. Bemis* in Boylston, June 18, 1933.

Carex Merritt-Fernaldii Mackenzie (*C. festucacea* of Gray's Manual, 7th ed.) G. Paxton, June 27, 1933. *Earl W. Bemis.*

Carex brevior (Dewey) Mackenzie (*C. festucacea* Schkuhr, var. *brevior* (Dewey) Fernald). S. Grafton, May 23, 1930. *D. L. Salter.* Also by *Earl W. Bemis* in Paxton, June 10, 1933.

Carex foenea Willd., var. perplexa Bailey. S. Worcester, June 14, 1930. *D. L. Salter.*

Carex leporina L. S. Worcester, June 18, 1931. *D. L. Salter.* Also by *Earl W. Bemis* in Paxton, June 28, 1933.

Carex angustior Mackenzie (*C. stellulata* Good., var. *angustata* Carey). C. Ashburnham, June 22, 1931. *C. M. Litch.* Also by *R. H. Lombard* in Spencer, June 2, 1933, and by *Earl W. Bemis* in Paxton, June 10, 1933.

Carex seorsa E. C. Howe. G. Paxton, June 10, 1933. "Not common anywhere." *Earl W. Bemis.* See Rh. **36**: 8.

Carex canescens L., var. subloliacea Laestad. S. Holden, May 22, 1930. *D. L. Salter.* Also by *Earl W. Bemis* in Boylston, June 20, 1933.

Carex trisperma Wahlenb., var. Billingsii Knight. G. Boylston, Oct. 17, 1932. *Earl W. Bemis.*

Carex annectens Bickn., (*C. setacea* Dewey, var. *ambigua* (Barratt) Fernald). G. Paxton, July 4, 1933. *Earl W. Bemis.*

Carex crinita Lam., var. gynandra (Schwein.) Schwein. & Torr. C. Fitchburg, June 26, 1932. *C. M. Litch.*

Carex stricta Lam., var. decora Bailey. S. Worcester, June 15, 1930. *D. L. Salter.*

Carex pennsylvanica Lam., var. distans Peck (*C. penn.*, var. *lucorum* (Willd.) Fernald). S. Sutton, May 11, 1930. *D. L. Salter.* Also by *Earl W. Bemis* in Worcester, July 20, 1933.

Carex caryophyllea Lat. S. Worcester, June 10, 1930. *D. L. Salter.*

Carex paupercula Michx., var. irrigua (Wahlenb.) Fernald. S. Worcester, June 11, 1932. *D. L. Salter.*

Carex debilis Michx., var. Rudgei Bailey. S. Worcester, May 24, 1930. *D. L. Salter.*

Carex lupulina Muhl., var. pedunculata Dewey. G. Boylston, Oct. 10, 1932. *Earl W. Bemis.*

Carex vesicaria L. S. Auburn, June 8, 1933. *D. L. Salter.*

Carex rostrata Stokes. G. Boylston, Oct. 14, 1932. *Earl W. Bemis.*

Carex rostrata Stokes, var. ambigens Fernald. S. Princeton, Sept. 5, 1932. *D. L. Salter.*

Juncus macer S. F. Gray, var. anthelatus (Wiegand) Fernald. (*J. tenuis* Willd., var. *anthelatus* Wiegand). G. Worcester, Aug. 6, 1933. *Earl W. Bemis.*

Juncus macer S. F. Gray, var. Williamsii Fernald. (*J. tenuis* Willd., var. *Williamsii* Fernald). G. Worcester, Aug. 6, 1933. *Earl W. Bemis.*

Juncus secundus Beauv. G. East Douglas, Aug. 19, 1933. *Earl W. Bemis.*

Juncus articulatus L. G. Paxton, Sept. 20, 1927. *Earl W. Bemis.*

Hosta caerulea (Andr.) Tratt. West Boylston, July 28, 1916. No herbarium sheet, a frequent escape. *Norman P. Woodward.*

Convallaria majalis L. Boylston, May 30, 1928. *Earl W. Bemis.* No herbarium sheet of this plant from this location.

Trillium erectum L., forma albiflorum R. Hoff. W. Tatnuck, May 15, 1932. *Clarence W. Kinney.* Also by *Mrs. R. B. Dodge* in Petersham. See Proc. Bost Soc. Nat. Hist. **36**: 244.

Narcissus Pseudo-Narcissus L. Worcester, May 3, 1933. *Norman P. Woodward.* No herbarium sheet, an escape, in open woods.

Narcissus poeticus L. W. Worcester, May 24, 1933. *Norman P. Woodward.* An escape, Peat Meadow (3 plants).

Iris variegata L. Worcester, June 4, 1923. *Norman P. Woodward.* No herbarium sheet, an escape, now established near Chadwick Square.

Cyripedium acaule Ait., forma albiflorum Rand & Redfield. Worcester (Rattlesnake Hill), June 14, 1920. *Norman P. Woodward.* No herbarium sheet, rare.

Pogonia ophioglossoides (L.) Ker., forma albiflora Rand & Redfield. Oxford, July 7, 1928. *Earl W. Bemis.* No herbarium sheet.

Spiranthes Romanzoffiana Cham. C. Leicester, July 24, 1932. *Cyrus Darling.*

Juglans nigra L. Worcester, June 2, 1922. No herbarium sheet. Occasionally about the city. *Mrs. R. B. Dodge.*

Alnus crispa (Ait.) Pursh, var. mollis Fernald. C. W. Harvard (Still River), Oct. 8, 1932. Rh. **15**: 44 for citation. *Mrs. Frank E. Lowe.*

Rumex persicarioides L. W. Worcester (Peat Meadow), Aug. 28, 1928. "A second record for New England." *Norman P. Woodward.*

Rumex Acetosa L. W. Oakham, July 1, 1928. *Mrs. R. B. Dodge.*

Polygonum aviculare L., var. littorale (Link) Koch. W. Worcester, Sept. 9, 1931. Sandy beach, Lake Quinsigamond. *Norman P. Woodward.*

Chenopodium leptophyllum Nutt. W. Worcester, Aug. 10, 1930. Spontaneous in garden. Rare. *Mrs. John W. Kemp.*

Cerastium tomentosum L. Worcester (Peat Meadow), June 8, 1930. No herbarium sheet. An escape in waste land. *Mrs. R. B. Dodge.*

Gypsophila paniculata L. W. Worcester, July 25, 1928. An escape in waste land. *Norman P. Woodward.*

Tunica Saxifraga (L.) Scop. W. Worcester (Waconah Road), July 30, 1932. *Mrs. R. B. Dodge.*

Dianthus Caryophyllus L. Worcester (Peat Meadow), June 29, 1929. No herbarium sheet. A garden escape. *Mrs. R. B. Dodge.*

Aguilegia canadensis L., forma Phippenii (J. Robinson) R. Hoffman. G. Boylston, May 1, 1925. *Earl W. Bemis.* Also *N. P. Woodward* in Worcester, May 27, 1933.

Cheiranthus Allioni Hort. W. Worcester (Peat Meadow), June 29, 1929. A horticultural variety, probably a hybrid. *Mrs. R. B. Dodge.*

Arabis Drummondi Gray. W. Berlin, May 15, 1933. *Mrs. R. B. Dodge.*

Philadelphus coronarius L. Worcester, June 21, 1928. No herbarium sheet. Escaped and established. *Norman P. Woodward.*

Spiraea japonica L. f. Worcester (Peat Meadow), Sept. 5, 1927. No herbarium sheet. An escape. *Norman P. Woodward.*

Spiraea prunifolia Sieb. & Zucc. Shrewsbury, June 3, 1925. No herbarium sheet. Along the lake shore. *Norman P. Woodward.*

Pyrus prunifolia Willd. W. Worcester (Chadwick Sq.) Sept. 1, 1926. *Norman P. Woodward.*

Pyrus japonica Thunb. Sutton, June 6, 1928. No herbarium sheet. An escape from garden. (Conn. Flora, 1910, p. 224. *Cydonia japonica* (Thunb.) Pers.). *Mrs. John W. Kemp.*

Amelanchier stolonifera Wieg. W. Worcester, May 16, 1933. See Rh. **14**: 144. *Mrs. Frank E. Lowe.*

Rhodotypos kerrioides Sieb. & Zucc. Worcester (June St.) May 21, 1932. No herbarium sheet. An escape. *Norman P. Woodward.*

Sanguisorba annua Nutt. W. Worcester (Peat Meadow), Sept. 22, 1930. In grading near building. A fugitive from the west. *Mrs. R. B. Dodge.*

Rosa setigera Michx. W. Worcester (Peat Meadow) July 21, 1929. *Mrs. R. B. Dodge.* Also *N. P. Woodward* in Worcester, July 13, 1930.

Rosa suffulta Greene. C. Worcester, Aug. 25, 1932. *Cyrus Darling.*

Prunus Cerasus L. Leicester, May 19, 1932. No herbarium sheet. Rare. *Mrs. R. B. Dodge.*

Vicia villosa Roth. W. Harvard (sandy pasture), June 8, 1933. *Mrs. R. B. Dodge and Mrs. Frank E. Lowe.*

Phaseolus multiflorus Willd. Worcester, Aug. 24, 1928. No herbarium sheet. An escape on dump. *Mrs. R. B. Dodge.*

Geranium pratense L. W. Tatnuck, May 21, 1932. Spont. in garden. *Clarence W. Kinney.* Seen in Sturbridge by *Mrs. R. B. Dodge*, June 8, 1933.

Acalypha gracilens Gray. W. Paxton, Aug. 29, 1926. *Earl W. Bemis.* Also *George Pride* in Worcester, Sept. 2, 1928.

Euphorbia marginata Pursh. W. Worcester, Aug. 2, 1928. *Norman P. Woodward.*

Evonymus europaeus L. W. Worcester, June 4, 1930. An established escape. *Mrs. R. B. Dodge.*

Acer Pseudo-Platanus L. W. Worcester, June 20, 1930. Occasionally spontaneous about the city. *Norman P. Woodward.*

Acer platanoides L. W. Worcester, May 27, 1933. Dried-up brook bed. Spontaneous about the city. *Norman P. Woodward.*

Impatiens biflora Walt., forma immaculata Weatherby. Worcester, Sept. 4, 1916. No herbarium sheet. Water hole, Lake Park. (Add. to Conn. Flora, 1930, p. 63 for citation). *Norman P. Woodward.*

Malva moschata L., var. alba Hort. W. Worcester (Peat Meadow), Aug. 4, 1927. An escape. *Norman P. Woodward.*

Malva Alcea L. W. Worcester (Peat Meadow), July 13, 1930. A rare escape. *Mrs. R. B. Dodge.*

Viola striata Ait. W. Tatnuck, May 13, 1929. *Clarence W. Kinney.* Also *Mrs. R. B. Dodge* in Fiskdale.

Viola arvensis Murr. W. Worcester, May 15, 1932. *Mrs. R. B. Dodge.*

Viola Rafinesquii Greene. W. Worcester, May 28, 1930. *Norman P. Woodward.*

Eryngium amethystinum L. W. Worcester, July 11, 1931. Escaped in grassland. *Norman P. Woodward.*

Lysimachia punctata L. W. Sturbridge, June 28, 1929. *Mrs. R. B. Dodge.*

Hydrophyllum canadense L. W. Worcester, June 22, 1933. *Walter S. Young.* No herbarium sheet of this specimen reported by Mr. Young. The herbarium specimen is that of *Mr. N. P. Woodward*, collected in Worcester, July 11, 1933.

Verbena hastata L., forma rosea Cheney. Worcester, Aug. 20, 1924. No herbarium sheet. See Rh. **4**: 245 for citation. *Norman P. Woodward.*

Prunella vulgaris L., var. lanceolata (Barton) Fernald. W. Worcester, July 27, 1927. See Rh. **15**: 182 for citation. *Norman P. Woodward.*

Monarda fistulosa L., var. rubra Gray. W. Worcester (Peat Meadow), July 18, 1921. *Norman P. Woodward.*

Physalis pubescens L. W. C. Worcester (Brattle St.) June 20, 1933. *Mrs. R. B. Dodge.*

Eupatorium coelestinum L. W. Worcester, Sept. 13, 1928. Escape into waste land. *Norman P. Woodward.*

Liatris spicata (L.) Willd. W. Worcester, Sept. 21, 1932. First specimen from New England in the Gray Herbarium. *Norman P. Woodward.*

Bellis perennis L. W. Worcester, May 17, 1933. Spont. in lawns. 4 records. *Norman P. Woodward.*

Aster pilosus Willd. Holden, Sept. 10, 1930. Herbarium sheet in the U. S. Dept. Agri. checked by S. F. Blake. See Rh. **32**: 139 for citation. *Earl W. Bemis.*

Aster amethystinus Nutt., forma leucerythros Bemis. G. Worcester, Oct. 5, 1924. *Earl W. Bemis.* A new form reported by Mr. Bemis in Rh. **32**: 3. Herbarium sheets are also at the Worc. Nat. Hist. Mus. (*Mrs. R. B. Dodge*) (Type in the Gray Herbarium).

Aster amethystinus Nutt., forma leucos Bemis. G. Worcester, Sept. 24, 1930. *Earl W. Bemis.* A new form reported by Mr. Bemis in Rh. **33**: 63. (Type in the Gray Herbarium.)

Aster linariifolius L., forma leucactis Blake. Worcester, Sept. 25, 1926. No herbarium sheet. *Mrs. Frank E. Lowe.* A good stand, a part of which was transplanted to Mrs. Lowe's wild garden where always available. See Rh. **34**: 12 for citation.

Rudbeckia hirta L., forma viridiflora S. H. Burnham. Worcester. Noted in 1928, 1929 and August 22, 1931. No herbarium sheet. Spontaneous in Museum grounds. Several plants. *G. H. Pride.*

Madia sativa Molina, var. congesta T. & G. Worcester (Rice Square), Oct. 28, 1928. No herbarium sheet. *George H. Pride.* Also by *Mrs. R. B. Dodge* in Worcester, June 29, 1929. Herbarium sheet at the Nat. Hist. Soc.

Clark University,
Worcester, Mass.

NOTES FROM THE HERBARIUM OF THE UNIVERSITY OF WISCONSIN—XII. A STUDY OF STREPTOPUS[1]

Norman C. Fassett

Plate 328

This study is based on the material in the Gray Herbarium, the United States National Herbarium, The New York Botanical Garden, the University of Minnesota, the Field Museum of Chicago, the University of Michigan, the University of Montreal, the University of Tennessee, the University of North Carolina, the National Museum of Canada, the Milwaukee Public Museum, the University of Wisconsin,

[1] Printed with aid to Rhodora from the National Academy of Sciences.

DETAILS OF STREPTOPUS.

FIGS. *a–d*, Rootstocks, × ½: *a*, of S. ROSEUS var. PERSPECTUS; *b*, of S. ROSEUS var. LONGIPES; *c* and *d*, of intermediate forms. FIGS. *e–i*, Peduncles and pedicels or flowers, × 1½: *e*, of S. OBTUSATUS; *f*, of S. ROSEUS var. PERSPECTUS; *g*, of S. ROSEUS var. TYPICUS; *h*, of S. ROSEUS var. PERSPECTUS; *i*, of S. ROSEUS var. TYPICUS. FIGS. *j* and *k*, Inner surface of sepal: *j*, of S. ROSEUS var. PERSPECTUS; *k*, of S. ROSEUS var. CURVIPES. FIG. *l*, Lower surface of leaf, S. AMPLEXIFOLIUS var. CHALAZATUS. FIG. *m*, Lower surface and margin of leaf, S. AMPLEX var. DENTICULATUS. FIGS. *n–r*, leaf-margins: *n*, of S. STREPTOPOIDES var. BREVIPES; *o*, of S. AMPLEX. var. AMERICANUS; *p*, of S. AMPLEX. var. DENTICULATUS; *q*, of S. AMPLEX. var. OREOPOLUS; *r*, of S. AMPLEX. var. DENTICULATUS.

and the private herbaria of Mr. C. C. Deam and of Prof. E. Lucy Braun. The writer wishes to express his appreciation to the officials of those herbaria from which he has borrowed material. He is also indebted to Mr. C. A. Weatherby, Professor M. L. Fernald, Professor F. K. Butters, and Professor F. C. Gates for their help in dealing with many phases of this work. To Professor A. J. Eames he is grateful for his notes on stem structure, quoted below.

Generic Characters

Streptopus: perennial herbs, from horizontal rootstocks; stem simple to several times forking; leaves elliptic or ovate, more or less tapering at tip and from sessile to somewhat clasping at base; peduncles supra-axillary, usually fused for some distance with the stem; perianth of 6 separate segments, campanulate or rotate; sepals usually a little broader than the petals; stamens 6; anthers apiculate to aristate at tip; filaments dilated; fruit a berry.

Very characteristic in this genus is the fusion of the lower part of the peduncle with the stem. This has been suggested by Arber[1] in the case of *S. amplexifolius*. Goebel,[2] on the other hand, interprets the arrangement as a sympodium, with each flower terminal, and the apparent extension of the main stem actually an axillary outgrowth. That Arber's suggestion is more correct is indicated by a study of other species. In *S. simplex* (fig. 1) we find the peduncles borne in an axillary position, but actually leaving the stem at a point a short distance above the leaf. For this short distance, then, the peduncle is fused with the stem; this fused portion is exaggerated in the drawing. In *S. parviflorus* (fig. 2) the same condition obtains, except that the fused portion is longer, bringing the emergence of the peduncle close to the leaf next above. In *S. amplexifolius* (fig. 3) the peduncle leaves the stem at a point very close to the leaf next above that in whose axil it was borne, and is often slightly fused with the margin of that leaf. Moreover, the peduncle as it leaves the stem is so twisted that the flower is not directly over the leaf in whose axil it actually arose, but on the opposite side of the stem, hanging under the leaf next above. In all the drawings, the fused portion of the peduncle is indicated by a heavy line. In the plants, there is a low ridge on that side, which is not as conspicuous as the drawings would indicate.

The remaining species have an inflorescence like that of *S. amplexifolius*. Professor A. J. Eames, who has examined microscopically material of *S. oreopolus* collected by the writer on Mt. Washington,

[1] Plant Life in Alpine Switzerland, 256 (1910).
[2] Blütenbildung und Sprossgestaltung, 44–45 (1931).

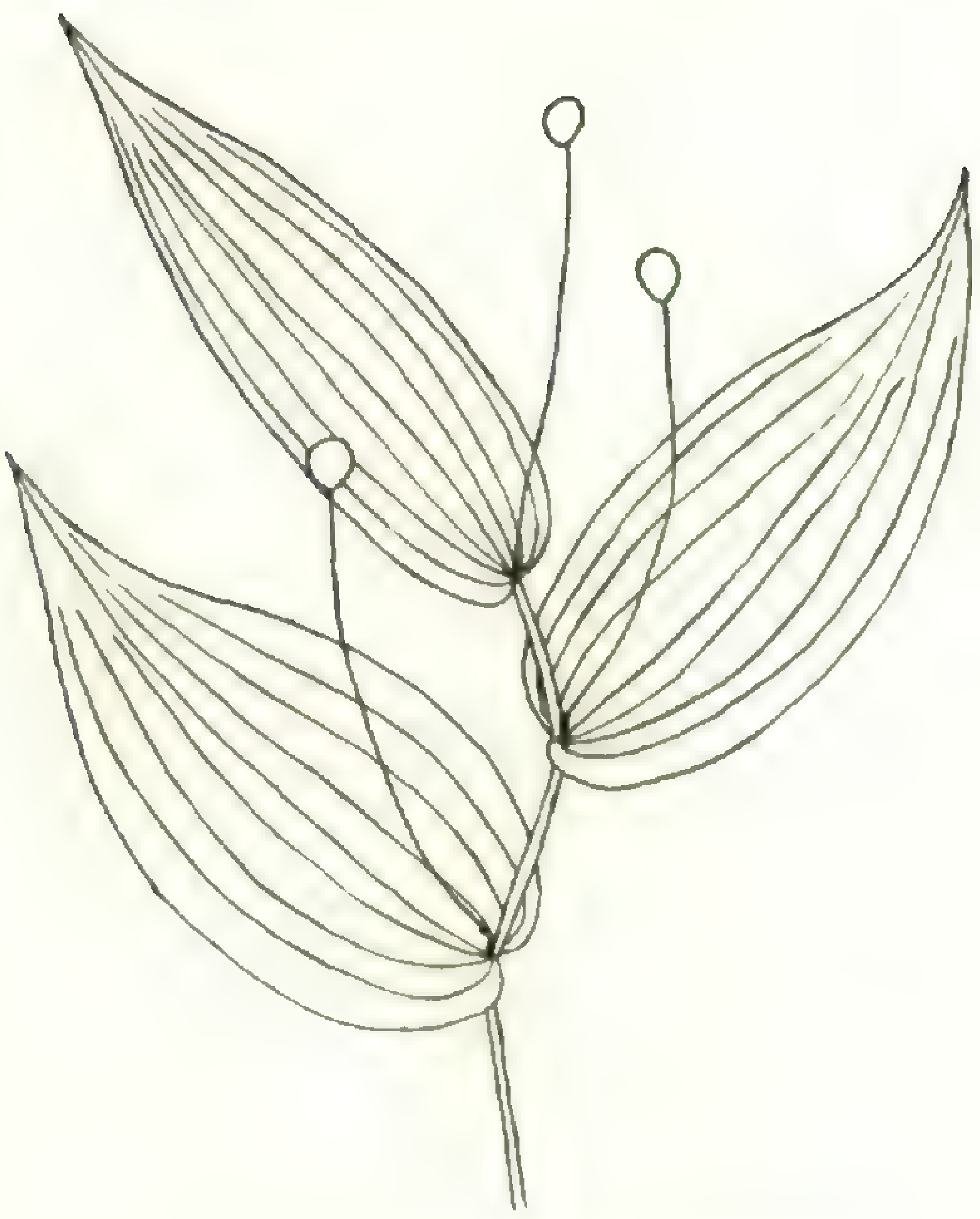


Fig. 1. Streptopus simplex. Fig. 2. Streptopus parviflorus.

Fig. 3. Streptopus amplexifolius.

New Hampshire, writes me: "I am sorry to say that there is no convincing evidence internally of the fusion. I had hoped to find it, but the union has apparently become very intimate. This does not mean that I do not think the fusion has not occurred. It surely has. The sections show clearly the unusual relationships of the leaf and peduncle."

The peduncle is sometimes branched, as is shown in FIG. 3, and at the point of branching is a minute bract or gland, representing, no doubt, a leaf. In the case of an unbranched peduncle, there is still a bract or gland in most cases; that this actually represents a leaf is shown by an individual of *S. longipes* which grew in the writer's garden, and which had at that point a green leaf 2 cm. long and several millimeters wide. The portion of the flowering stalk beyond the bract is obviously a pedicel.

S. paniculatus Baker, in Hook, Icon. Pl. xx. t. 1932 (1890) has a very different type of inflorescence, and is out of place in the genus *Streptopus;* the writer will leave to some one more familiar than he with the flora of Asia the placing of this species in its correct genus.

Whether or not *Kruhsea* is treated as a separate genus must rest upon personal judgment. To the writer, two facts seem to warrant the merging of *Kruhsea* with *Streptopus.* The first is the same unique type of inflorescence found in both. The second is the parallelism shown by the variations within each group; the variations in rootstocks, dentation of leaf-margins, and even papillation of perianth-segments, found in *Streptopus* proper, have their counterparts in *Kruhsea.* Only the rotate corolla and sessile stigma separate *Kruhsea* from *Streptopus.* They might stand as not very distinct genera, but as two sections of one genus they are well marked. As for the recently proposed genus *Tortipes,*[1] including only *T. amplexifolius:* if *S. amplexifolius* is treated as a genus distinct from *S. roseus,* then *S. simplex* and *S. parviflorus* are both distinct genera also, and the seven species here distinguished comprise five genera instead of one.

Systematic Treatment

The seven species of *Streptopus* here considered are remarkably distinct, in spite of the similarity of habits throughout the genus. Within several of the species there is considerable variation, but the variation in no cases results in the overlapping of species.

[1] Small, Man. Southeastern Fl. 298 (1933).

a. Perianth campanulate; style filiform; flower-stalk (except often in nos. 1 and 2) with a gland or bractlet representing junction of peduncle and pedicel; nodes glabrous or fringed. . . . *b*.

b. Peduncle emerging from the stem directly above the leaf in whose axil it was borne, and not at all fused with the leaf next above. . . . *c*.

Peduncle only slightly supra-axillary, emerging from the stem at a point close to the leaf in whose axil it was borne; perianth 1 cm. or more long; anther longer than the filament; style-branches nearly 2 mm. long. . . . . . 1. *S. simplex*.

Peduncle emerging from the stem near the leaf next above that in whose axil it was borne; perianth 8 mm. or less long; anther shorter than the filament; style-branches 1 mm. or less long. . . . . 2. *S. parviflorus*.

b. Peduncle twisted at its emergence from the stem, so that it hangs under, and is often slightly fused with, the margin of the leaf next above that in whose axil it arose. . . . *c*.

c. The distal third to half of each perianth-segment widely spreading or strongly recurved at tip; stigma barely 3-lobed; anthers tapering to an entire point; nodes glabrous; leaves cordate-clasping at base. . . . . . 3. *S. amplexifolius*.

d. Pedicels 8–18 mm. long, usually exceeding the flower or mature fruit; leaves distal to the uppermost flower 3–5, rarely only 1. . . . . var. *genuinus*.

d. Pedicels rarely exceeding 1 cm. in length, usually shorter than the flower or mature fruit; leaves distal to the uppermost flower 1–3, very rarely 4, or the branch sometimes terminated by a flower. . . . *e*.

e. Leaf-margins entire or with very minute scattered teeth not exceeding 6 per cm. . . . . *f*.

f. Leaves minutely but copiously papillate beneath. var. *chalazatus*.

f. Leaves not papillate beneath. . . . . var. *americanus*.

e. Leaf-margins with 10–40 minute teeth per cm., these mostly rather regularly distributed. . . . *g*.

g. Leaf-margins with 10–25 teeth per cm., these mostly wider at base than long; pedicels and leaf-surfaces always glabrous. . . . *h*.

h. Perianth with a spread of 7–16 mm., its segments 7–13 mm. long.

Perianth with a spread of 7–9 mm., its segments 7–9 mm. long; leaves not glaucous beneath. . . . . var. *papillatus*.

Perianth with a spread of 9–16 mm., its segments 8–13 mm. long; leaves glaucous beneath. . . . . var. *denticulatus*.

h. Perianth with a spread of 13–26 mm., its segments 13–17 mm. long. . . . . var. *grandiflorus*.

g. Leaf-margins with 22–40 teeth per cm., these mostly longer than broad or even resembling the cilia of *S. roseus;* pedicels sometimes ciliate; leaves often with scattered hairs below. . . . . . var. *oreopolus*.

c. Perianth-lobes slightly if at all spreading at tip; anthers 2-pointed; stigmas definitely 3-parted at tip. . . . *i*.

i. Leaves clasping the stem; stem and peduncles glabrous; nodes not fringed; styles 3-lobed 2/3 of the way to the base; anthers long-triangular, the sides tapering from base to apex; perianth-segments obtuse or rounded at tip. . . . . 4. *S. obtusatus*.

i. Leaves sessile but not clasping; stem and usually the peduncles ciliate with multicellular hairs; nodes

fringed; style 3-lobed less than ¼ of the way to the base; anthers ovate, the sides rounded; perianth-segments acute to acuminate (the tips often withering in pressed specimens)......................5. *S. roseus.*

j. Rootstock matted, the internodes so short as usually to be obscured by the copious roots, and to cause the current year's stem to appear close beside the remains of last year's; leaves with 22–60, mostly 30–50, cilia per cm.; perianth-segments glabrous within, or rarely with microscopic long low papillae; sepals (7–)9–11-nerved; style-branches mostly ascending....*k.*

k. Pedicels glabrous............................var. *typicus.*

k. Pedicels ciliate with multicellular hairs....*l.*

l. Perianth 6–10 mm. long; stamens 2.5–5.5 mm. long; mucro on anthers 0.2–0.5 mm. long; style-branches 0.2–0.7 mm. long.........var. *perspectus.*

l. Perianth 10–12 mm. long; stamens 5–7 mm. long; mucro on anthers 0.5–1.0 mm. long; style-branches 1.1 mm. long..var. *perspectus,* f. *giganteus.*

j. Rootstock slender, wide-creeping, with internodes several cm. long and small tufts of roots at the nodes; leaves with rarely more than 30 cilia per cm.; perianth-segments minutely papillate-pubescent within; sepals 3–5-nerved; style-branches often spreading.

Stems often branched; leaves mostly with 20–30 cilia per cm.; peduncle and pedicel together 6–22(–42) mm. long; papillae of perianth about 28 mu long..............................var. *longipes.*

Stems usually simple; leaves entire on the margins or with 16 (rarely –20) or fewer cilia per cm.; peduncle and pedicel together 5–15 (–20) mm. long; papillae of perianth 30–75 mu long...var. *curvipes.*

a. Perianth rotate; style absent, stigma conical and sessile; flower-stalk without a gland; nodes fringed....*m.*

m. Perianth-segments not papillate within, sometimes finely pubescent toward the tip; peduncles 3–15 mm. long; leaves margined with minute tooth-like hyaline cells, sometimes also ciliate..........................6. *S. streptopoides.*

n. Fruit red....*o.*

o. Leaves ciliate...................................var. *verus.*

o. Leaves not ciliate....*p.*

p. Plant 8–20 cm. high, mostly simple; petals with cupped or revolute margins...................var. *brevipes.*

p. Plant reaching 3 dm. in height, often forking; petals plane....................................var. *japonicus.*

n. Fruit black...................................var. *atrocarpus.*

m. Perianth-segments papillate within; peduncles 1.5–3 cm. long; leaves ciliate, without tooth-like marginal cells....7. *S. koreanus.*

1. S. SIMPLEX Don, Prod. Fl. Nepal 48 (1825) and Trans. Linn. Soc. xviii. 530 (1841); Schultes fil. Syst. Veg. vii. 312 (1829). *S. candida* Wall. Cat. no. 5112 (1828). *Hekorima candida* Kunth, Enum. iv. 204 (1843).—Specimens examined[1]: INDIA: Sikkim, alt. 12000 ft., *J. D. Hooker* (Gray); Sikkim, alt. 16000 ft., July, 1878, *Dr. King's collector,*

[1] The location of cited specimens is indicated by abbreviations in parentheses as follows: (Gray) Gray Herbarium, Cambridge, Massachusetts; (U. S.) United States National Herbarium, Washington, D. C.; (N. Y.) New York Botanical Garden; (Field) Field Museum of Chicago.

(Gray); amongst scrub and in open forests on w. flank of N'Maikha-Salwin divide, 11000 ft., Upper Burma, June, 1925, *G. Forrest*, no. 26877 (U. S.; N. Y.); margins of thickets on w. flank of N'Maikha-Salwin divide, 13000 ft., Upper Burma, September, 1925, *Forrest*, no. 27255 (U. S.). China: Mount Lauchünchan, southwest of the Yangste bend at Shiku, Yunnan, June, 1923, *J. F. Rock*, no. 9571 (Gray; U. S.; N. Y.); Tibet Himalaya, July 22, 1877, *G. King*, no. 4273 (U. S.); shade of spruce forest, alt. 12,000 feet, Mt. Kenichunpo, May–July, 1932, *Rock*, no. 21947 (N. Y.).

2. S. parviflorus Franch., Nouv. Arch. Mus. Paris, Sér. II. x. 89[1] (1888); Pl. Dav. 127 (1889). Since the original description is not available in most libraries, it is here reprinted: "Glaberrimus; caulis gracilis, dichotomus; folia late amplexicaulia, ovato-lanceolata, acuminata, subtus glauca; pedicelli capillares, erecti vel ascendentes; flores ex axillis solitarii, albi, parvi; perianthii campanulati segmenta erecta oblonga obtusa; stamina perianthio subduplo breviora, filamentis e basi paulo latiore late linearibus antheras oblongas breviter bicuspidatas saltem aequantibus; stylus stamina vix aequans, breviter tricuspidatus; baccae . . .

"Pedalis usque bipedalis; folia 2–3 poll. longa, 2–2½ cent. lata; pedunculi pollicares; perianthium 6 mill. longum.

"Moupine, in silvis umbrosis. Fl. Jun. 1869.

"Plante grêle à feuilles glauques en dessous; elle tient le milieu entre le *S. simplex* et le *S. roseus* Mich.; elle diffère du premier par ses fleurs deux fois plus petites, par son style très brièvement tricuspidé et non pas divisé presque jusqu'au milieu par ses anthères égalant à peine le filet et non pas une fois plus longues. Il se distingue du second par l'absence complète de poils sur les pédicelles, sur la tige et sur le bord des feuilles, par le périanthe à lobes très obtus et ne se recourbant pas en dehors."

On one of the specimens cited below, the fruit is noted as being "red, berry-like, triangular."

Specimens examined: China: Szechuan: Nanchuan Hsien, 1928, *W. P. Fang*, no. 1143 (Gray; N. Y.); Omei Hsien, Mt. Omei, 1928, *Fang*, no. 2831 (Gray); near Tachienlu, at 9000–13,500 ft., *A. E. Pratt*, no. 52 (Gray); western Szechuan, August, 1908, *E. H. Wilson*, no. 926 (Gray; U. S.). Yunnan: Chungtien, alt. 3600 m., August, 1914, *Camillo Schneider*, no. 2391 (Gray).

There is nothing in the description of *S. Mairei* Levéillé, Bull. Geogr. Bot. xxv. 39 (1915), to indicate that it differs from *S. parviflorus*. This description, kindly supplied by Miss Vincent and Mr. Standley of the Field Museum, is as follows: "Peraffinis *S. amplexifolio* a quo tamen diversus *foliis subtus glaucis* et *pedicello* florali non *articulato*. Flores albi 4–7 mm. diametientes. Yun-Nan: pâtures du plateau de Ta-Hai, 3200 m., Juillet 1912 (*E. E. Maire*)."

[1] The Kew Index lists this as page 90, but the description begins on the previous page. I am indebted to Miss Amy Hepburn of the Columbia University Library for a copy of this description.

3. S. AMPLEXIFOLIUS (L.) DC. in Lam. & DC. Fl. de France iii. 174 (1805).

This species is variable in several respects. The berries, as described by several authors, seem to vary somewhat in color. European writers mention red berries, as do most American, in describing plants from the western portions of the continent[1] as well as from the eastern.[2] It is surprising, therefore, to find the words "berry white" used by Rydberg[3] and by Abrams[4] to distinguish *S. amplexifolius* from *S. curvipes.* Rydberg later[5] characterized this fruit as "scarlet, rarely white." Howell[6] described it as "yellow or red." In this connection, Dr. F. K. Butters wrote to me on April 10, 1933, "Please note the almost black berries on some of the Selkirk Mt. specimens. There are two forms there, one with orange-red berries, the other with crimson-black berries. They often grow together, and studying them in the field I never could discover any other differencies." A specimen from Glacier, British Columbia, collected by Dr. Butters and noted by him as being the black-berried form, seems in its other characters to belong with other plants of the western slopes and of the Lake Superior region; the middle-western plants, at least, ordinarily have red berries. The color of the fruit is not used in this treatment, but it is to be urged that collectors make notes on this character, which may yet prove to have some taxonomic significance.

There may be some variation in rootstocks; a few plants with fragments of underground parts suggest this. That these variations may be at least in part ecological in nature is suggested by specimens of *S. oreopolus* (which seems to be but an extreme phase of *S. amplexifolius*) found by the writer on Mt. Washington, New Hampshire. These grew in the water of a small stream above Tuckerman's Ravine, and had rootstocks so elongate that at least one internode measures 2.5 cm. in length.

The size of the flowers varies throughout a wide range, but with no apparent localization of forms except in northwestern Oregon, where there is a large-flowered extreme, and in Japan, where there is a small-flowered plant. Occasional specimens in both Europe and America

[1] Armstrong, Field Book of Western Wild Flowers 46 (1915). Coulter, Man. Bot. Rocky Mt. Region 347 (1885). Piper & Beattie, Fl. N. W. Coast 102 (1915). Jepson. Man. Fl. Pl. Calif. 248 (1923).

[2] Gray's Man., ed. 7: 292 (1908). Victorin, Contrib. Lab. Bot. Univ. Montréal xiv. 95 (1929). Britton & Brown, Ill. Fl., ed. 2: i. 520 (1913).

[3] Fl. Rocky Mts., ed. 2: 168 (1922).

[4] Ill. Fl. Pacific States i. 457 (1923).

[5] Fl. Prairies & Plains 220 (1932).

[6] Fl. N. W. Am. 658 (1903).

have the perianth-segments minutely papillate within, but this does not seem to correlate with anything else.

In the leaves are found definite characters, but they are so minute as to be almost invisible with an ordinary hand-lens. Throughout this study a binocular microscope was used, with a magnification of 17 or of 28.9 times. A piece of black paper or of blackened photographic film was cut one centimeter wide and inserted under the loose edge of a leaf to be studied. There then become visible on the margins of leaves of many plants minute teeth (plate 328, m & p). These are best developed on certain plants about the Pacific ocean and in the upper Great Lake region. They are completely lacking on the plants of the eastern slopes of the Rockies and of most of New England. Some plants of the western slopes of the Rockies (where the denticulate-leaved plants also occur), of the middle west, and of the more northern regions in the east, have occasional poorly developed teeth. These individuals thus grade into the other form, but in most cases the teeth are so sparse and minute that the plants are here treated with the entire-margined ones. To try to separate these varietally would end in absurdity, for it would mean going over every millimeter of leaf-margin to see if perhaps a single minute tooth might be found. In plate 328, fig. o, one small tooth is shown on a leaf classified with the entire-margined group. Although it is impracticable to treat these with the western form, it is perhaps significant that these slightly denticulate leaves are on plants from the north, occurring in Greenland, Labrador, Newfoundland, the Mingan Islands, Anticosti, the Magdalen Islands, the Gaspé Peninsula, and in the northeastern states only on Mts. Katahdin, Washington, Mansfield, and Marcy. Even the plants of Europe have teeth on some of the leaves of every specimen seen by the writer, although the only mention of this character seems to have been made by Watson,[1] who wrote of the western American plant, "leaves . . . very rarely slightly scabrous on the margins."

A definite, if minute, variation occurs in certain plants of the Rocky Mountains, which seem to constitute an offshoot from the widespread entire-margined variety. In these, the lower surface of the leaves is covered with minute papillae (plate 328, l); these are readily seen under the magnifications mentioned above, especially if a slight ridge or depression in the leaf allows the light to fall nearly parallel to the surface. They are particularly well developed near the veins.

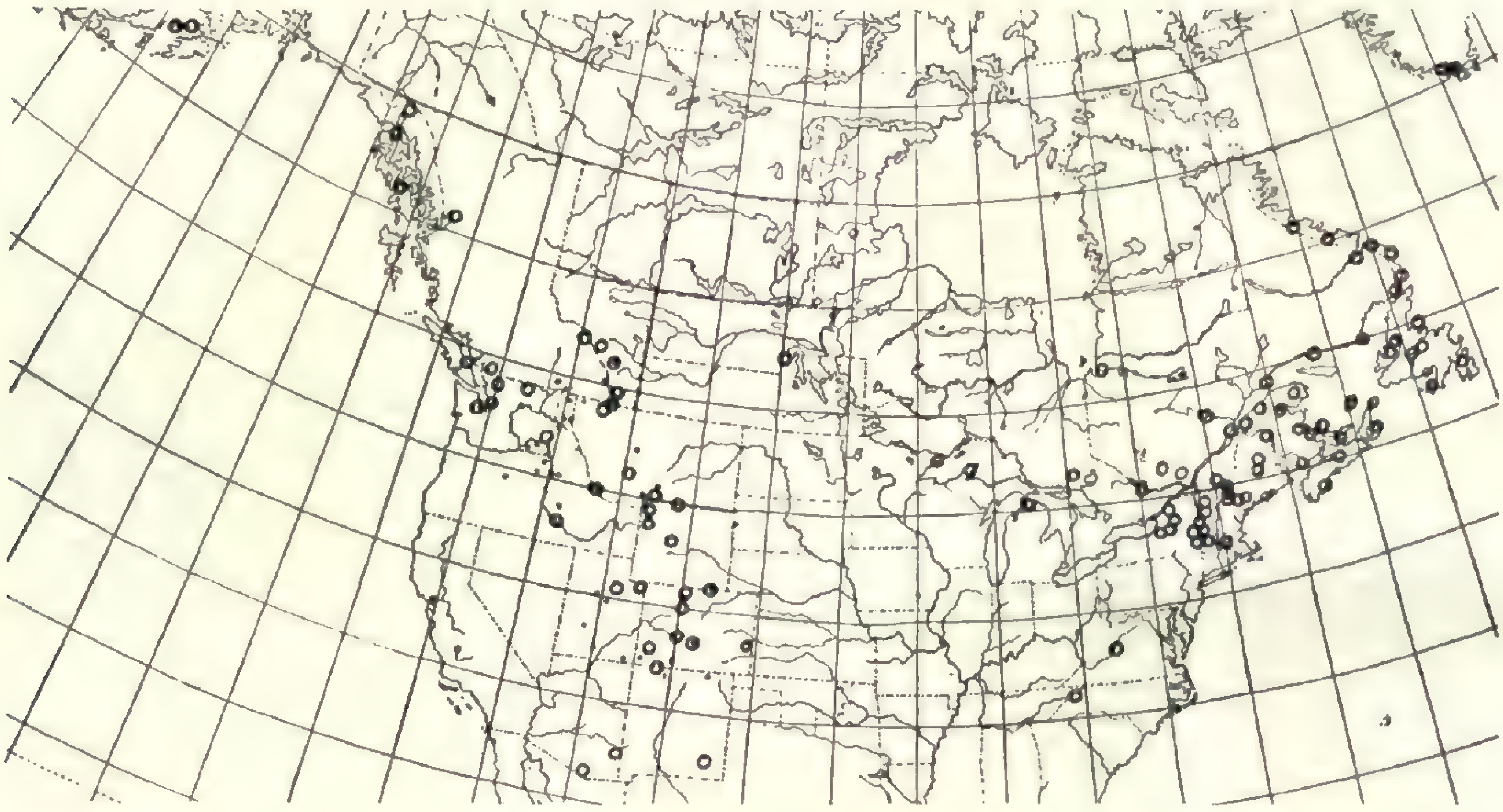
[1] Bot. Cal. ii. 178 (1880).

Some leaves do not show these papillae unless the source of light is placed very close to the surface, when they become clearly visible. None of the papillate-leaved plants have any trace of marginal teeth; none of the denticulate-leaved plants ever have any papillae.

It is not possible to separate the American plants specifically from the European, but strong tendencies are shown in two sets of characters. The European plants have in general longer pedicels (*i. e.*, the part between the flower and the twist or bracted point) than the American, as was noted many years ago,[1] and are usually provided with a greater number of sterile leaves on each branch distal to those associated with the flowers. While there is sometimes overlapping in these characters, particularly in the Rocky Mountains, where rarely occur long-pedicelled individuals approaching the European variety, they seem in combination sufficient to justify varietal separation.

S. amplexifolius, var. **genuinus**. *Uvularia amplexifolia* L. Sp. Pl. i. 304 (1753).—Mountainous regions of southern Europe.

S. amplexifolius, var. **chalazatus**, n. var., var. *americanum* simulans; foliis sine dentibus, subtus cum copiosis minutis papillis. (Plate 328, fig. 1).—Southern British Columbia and Washington to



Map 1. Ranges of Streptopus amplexifolius, var. chalazatus (dots) and var. americanus (circles).

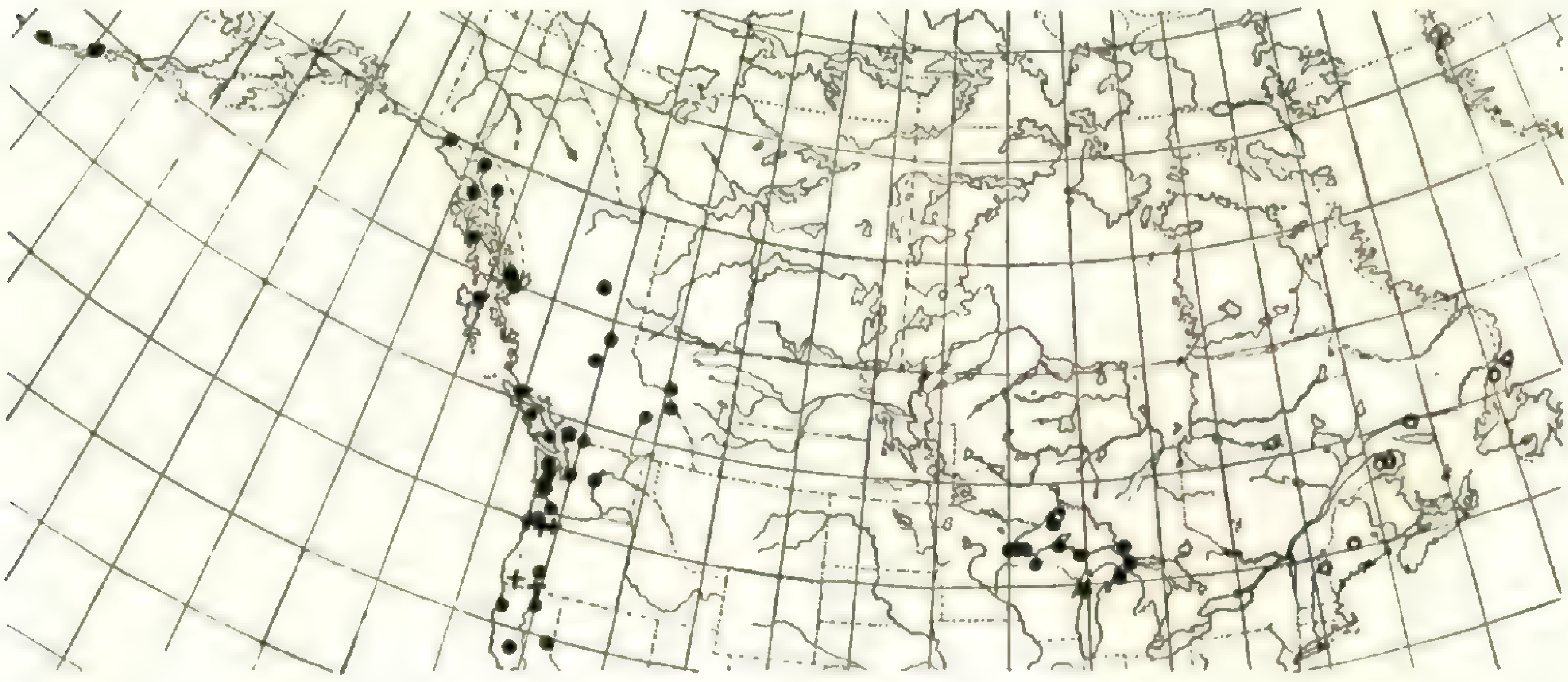
South Dakota and southern Utah and New Mexico (map 1, dots). Type in Herbarium of the University of Wisconsin: Wallowa Lake, Oregon, June 15, 1933, *H. P. Hansen*, no. 1100.

[1] Don, Trans. Linn. Soc. xviii. 529 (1841).

S. amplexifolius, var. americanus Schultes, Syst. Veg. vii. 311 (1829). *S. distortus* Michx. Fl. Bor.-Am. i. 200 (1803). (Plate 328, fig. o.)—Greenland to New England and northern New York, and to North Carolina in the mountains; rarely about the northern Great Lakes region where it grades into the next; Alaska to Washington, and in the mountains to Arizona and New Mexico (map 1, circles). Where this range overlaps that of var. *chalazatus*, the two plants apparently may occur together.

This also occurs in Kamchatka. Dr. Eric Hultén, who has been kind enough to examine his collections from that region, finds one of var. *americanus*, four distinctly var. *denticulatus*, and five intermediate. He also writes me that all material from the Aleutian Islands is clearly var. *denticulatus*, as is most of that from other parts of Alaska.

S. amplexifolius, var. **denticulatus**, n. var., var. *americanum* simulans; foliorum marginibus cum minutis dentibus 10–25 per cm. (Plate 328, figs. m, p & r).—About Lake Superior and the northern



Map 2. Ranges of Streptopus amplexifolius, var. denticulatus (dots), var. grandiflorus (crosses) and var. oreopolus (circles).

end of Lake Michigan; Aleutian Islands to northern California; Amur; Kamchatka. (map 2, dots). Type in Herbarium of the University of Wisconsin: wet wooded gully, Mellen, Wisconsin, June 7, 1934, *N. C. Fassett & Julius Popko*, no. 16716.

To the list of plants of the Pacific slopes of the continent which reappear about Lake Superior may be added *S. amplexifolius* var. *denticulatus*. Indeed, the combined range of this and the next variety bears a very close resemblence to that of the Devil's Club,[1] except that the latter has a much more restricted range in the middle west.

S. amplexifolius, var. papillatus Ohwi, Tokyo Bot. Mag. xlv. 185 (1931).

The original description reads, "Caulis inferne papillis longis sparse

[1] See Fernald, Mem. Am. Acad. of Arts & Sci. xv. 257, map 22 (1925).

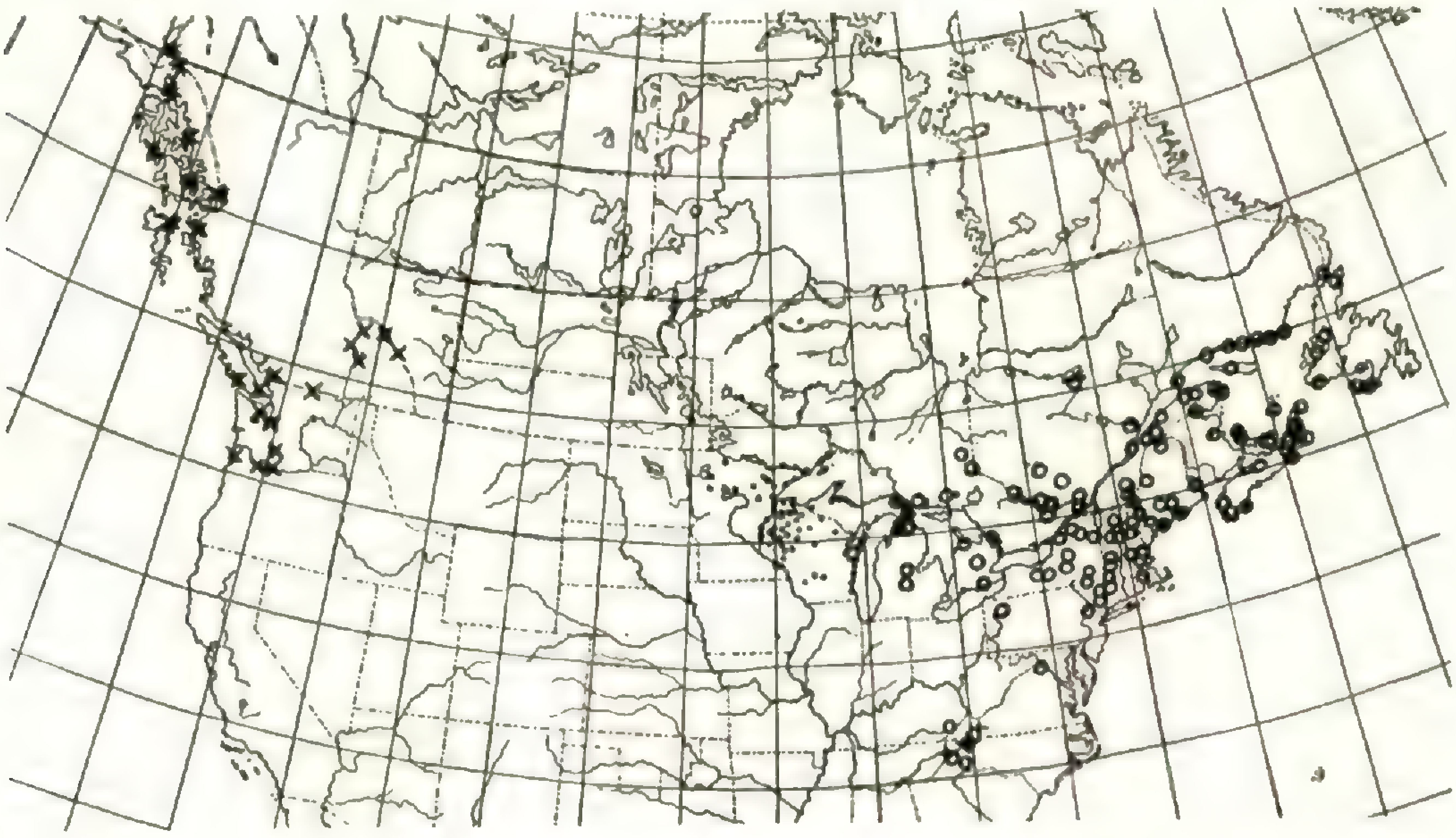
obsitus," indicating that its author was describing plants which develop a coarse pubescence toward the base of the stem. Such plants may occur anywhere throughout the range of *S. amplexifolius.* If the plant of Japan is recognized as a variety distinct from those of Europe and most of North America, the inappropriate name *papillatus* must be applied to it, and the variety redefined as follows: Leaves minutely denticulate, green both sides; perianth-segments 7–9 mm. long, with a spread of from 7–9 mm. In var. *americanus* small flowers are sometimes found, but with one exception the only denticulate-leaved plants with small flowers are from Japan. The exception is from shaded woods, Hoonah, Alaska, June 7, 1915, *Mr. & Mrs. E. P. Walker*, no. 683 (Gray). This specimen should probably be considered as var. *papillatus,* although the leaves are somewhat whitened beneath. Another specimen, no. 679, of the same habitat, locality, date, and collectors, is typical var. *denticulatus.*

S. AMPLEXIFOLIUS, var. **grandiflorus**, n. var., var. *denticulatum* simulans, sed foliis longioris latioribusque; floribus 13–17 mm. longis, 13–26 mm. extendentibus.—Western Oregon (MAP 2, crosses): wet rocks, Falls City, May 12, 1917, *J. C. Nelson*, no. 1143 (TYPE in Gray Herbarium); rocky banks of Wilson's River, 15 miles above Tallamook, April 21, 1928, *J. W. Thompson*, no. 4114 (Gray); rocky banks of Santian River, near Mehana, Marion County, May 9, 1928, *Thompson*, no. 4170 (Gray; U. S.); Wimer, May 26, 1892, *E. W. Hammond*, no. 391 (N. Y.; U. S.).

S. AMPLEXIFOLIUS, var. **oreopolus** (Fernald), n. comb. *S. oreopolus* Fernald, RHODORA viii. 70 (1906). (PLATE 328, FIG. q).—Newfoundland; Mingan Islands and Gaspé and Matane Counties, Quebec; Mt. Katahdin, Maine; Mt. Washington, New Hampshire (MAP 2, circles).

While this plant stands out as strikingly distinct from the *S. amplexifolius* var. *americanus* of northeastern America, a study of other varieties of *S. amplexifolius* throws doubt on the specific validity of *S. oreopolus.* Its leaves are copiously ciliate, thus differing from those of the representative of *S. amplexifolius* common in the region, but the western *S. amplexifolius* var. *denticulatus* approaches it in this character; PLATE 328, FIG. r, shows the leaf-margin of a plant from Oregon, which, had it been collected in the region where *S. oreopolus* is found, would certainly have been treated with it. *S. oreopolus* often has ciliate pedicels and peduncles, but they may be glabrous as in other varieties of *S. amplexifolius.* The perianth-segments of *S. oreopolus* are always copiously papillate within; while the other varieties of *S. amplexifolius* often lack this character, occasional specimens show well-developed papillae. The dark red flowers of *S.*

oreopolus differ conspicuously from the whitish or greenish ones of its neighbor, *S. amplexifolius* var. *americanus*, but for the flowers of the European plant we find such descriptions as "weiss, aussen rötlich oder grünlich,"[1] or "aussen grünlich-gelb, innen weiss mit röthlichem Anflug,"[2] or "white, with a reddish tinge."[3] Turning to illustrations of the European plant, we find that, while some show white[3,4] or yellow[5] perianths, others[6] indicate a pinkish tinge, or even deep red[2,7] toward the base. While most authors describe the flower of the western American plants as white or greenish,[8] others[9] include the term "or purplish" in the description. Concerning the plant



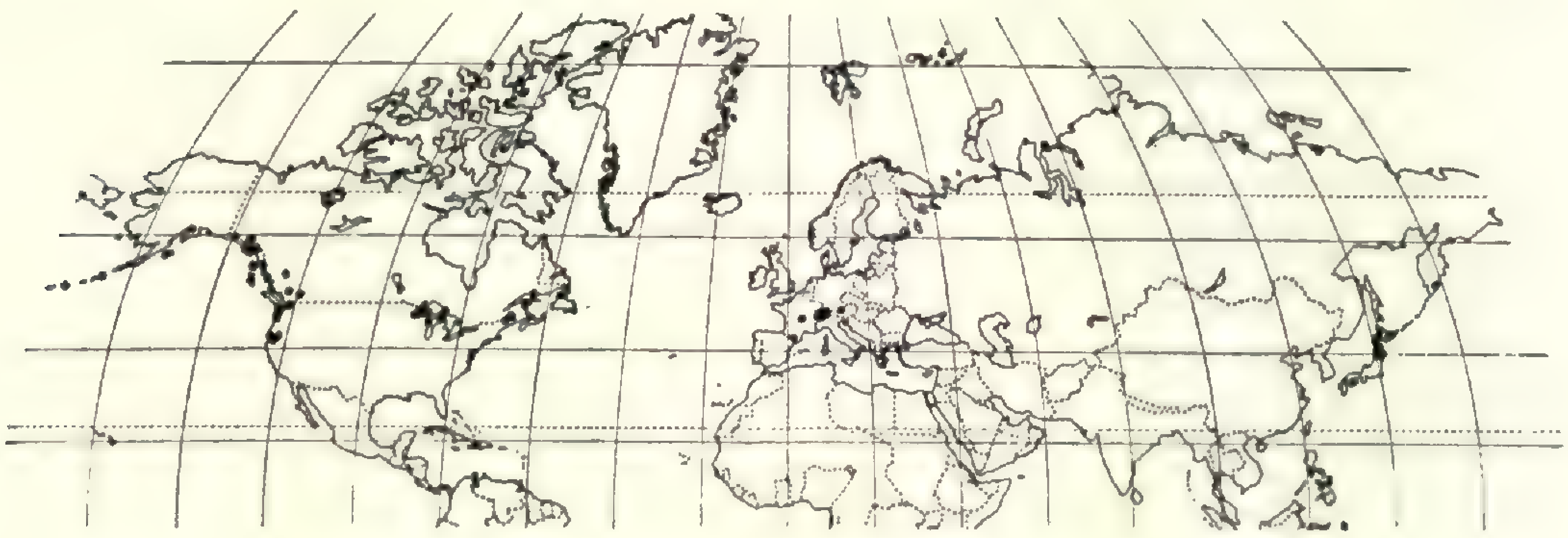
Map 3. Ranges of STREPTOPUS ROSEUS, var. TYPICUS (crosses), var. PERSPECTUS (circles), var. LONGIPES (dots) and var. CURVIPES (x's).

of eastern Asia we find "flores sordide rosei"[10] and "flowers white, shaded rose-purple."[11] A specimen from Tillamook County, Oregon (June 25, 1894, *F. E. Lloyd*, in New York Botanical Garden) bears the

[1] Hegi, Ill. Fl. Mitt.-Eu. ii. 268 (1909).
[2] Schlechtendal, Lang & Schenk, Fl. Deutschl. ed. 5, iv. 13 (1880).
[3] Seboth & Bennett, Alp. Pl. iii. 51 (1880).
[4] Hartinger, Atlas Alpenfl. 450 (1884).
[5] Redouté, Liliac. v. t. 259 (1819).
[6] Peterman, Deutsch. Fl. 570, t. 89, fig. 702 (1894).
[7] Reichenbach, Ic. Fl. Germ. x. t. 431 (1848).
[8] Watson, Bot. Cal. ii. 178 (1880); Howell, Fl. N.-W. Am. i. 658 (1903); Frye & Rigg, Northwest Flora 109 (1912); Piper, Fl. Wash., in Contrib. U. S. Nat. Herb. xi. 201 (1906); Gilkey, Spring Flora of Northwestern Oregon 9 (1929).
[9] Coult. & Nelson, Man. Bot. Central Rocky Mts. 119 (1909); Clements & Clements, Rocky Mt. Flowers 310 (1914).
[10] Maxim., Primit. Fl. Amur. 274 (1859).
[11] Diels, Pl. Chin. Forrest. 272 (1912).

annotation "perianth red," and a sheet from Mt. Selwyn, British Columbia (*Raup & Abbe*, no. 4178, in the Gray Herbarium) clearly shows pink flowers. The type collection of *S. amplexifolius* var. *denticulatus* has the perianth-segments flecked with deep pink within.

It is perhaps significant that *S. amplexifolius* var. *oreopolus*, so distinct from the wide-ranging var. *americanus*, and occupying an area known to have many species of ancient distribution,[1] should approach on the one hand *S. amplexifolius* var. *genuinus* of southern Europe but not the more northern extensively glaciated portions of that continent, and on the other hand vars. *denticulatus* and *papillatus*, whose combined ranges almost coincide with that of the Devil's Club. Map 4 shows the disrupted ranges of this plant and its allied varieties:



Map 4. Ranges of Streptopus amplexifolius, var. genuinus (so. Europe), var. oreopolus (e. North America), var. denticulatus (Great Lakes reg., w. North America and Kamchatka) and var. papillatus (Japan).

in Europe, *S. amplexifolius* var. *genuinus;* in eastern North America, var. *oreopolus;* in the Great Lakes region, western North America, and Kamchatka, var. *denticulatus;* in Japan, var. *papillatus*.

It has been suggested that *S. oreopolus* may be a hybrid of *S. amplexifolius* [var. *americanus*] and *S. roseus*.[2] Victorin[3] points out that a cross of two plants, one with a flower practically white and the other with rose-colored flowers, would scarcely be expected to have a dark red perianth. To this may be added the observation that *S. oreopolus* has the perianth-segments conspicuously papillate within, while *S. amplexifolius* var. *americanus* rarely has well-developed papillae, and the representative of *S. roseus* occurring in that region lacks papillae of the type found in the purported hybrid. Furthermore, if *S. amplexifolius* and *S. roseus* can hybridize, why do they

[1] See Fernald, Mem. Am. Acad. of Arts & Sci. xv. no. III (1925).
[2] Fernald, Rhodora ix. 107 (1907).
[3] Contrib. Lab. de Bot. Univ. de Montréal xiv. 21 (1929).

not do so in the many other places where their ranges overlap, instead of only in one limited region? In short, when we consider the floral morphology of *S. oreopolus*, and its apparently close relationship to the western forms of *S. amplexifolius*, keeping in mind the numerous other plants of the Gulf of St. Lawrence region which also show relationship to western forms, it seems less likely that it is a hybrid of local origin than that it is a relic, closely allied to certain varieties of *S. amplexifolius*, which are found in remote regions.

On Mount Washington, New Hampshire, just above Tuckerman's Ravine, may be found a most interesting series of variations of *S. amplexifolius*. Var. *oreopolus* is abundant, and var. *americanus* can also be found. A third type of plant has denticulate leaves like those of var. *denticulatus*. Since its leaf-margin is intermediate between that of var. *americanus* and that of var. *oreopolus*, and, in addition, the lower leaf-surface is less glaucous than in the former, but more so than in the latter, it is considered as a hybrid of these two varieties. The flowers, which were just beginning to open when observed by the writer on June 27, 1934, were nearly white and conspicuously papillate within. Perhaps some New England amateur will find it possible to study these variations throughout a season. The expanded flowers should be observed, especially for correlation of perianth-color with degree of toothing on the leaf-margin, and the fruit-colors should be noted.

4. S. **obtusatus**, n. sp., planta glabra; foliis amplexicaulibus, marginibus ciliatus; perianthiis campanulatis, segmentis obtusis; antheris filamentibus subaequalibus, basi cordatis, triangularibus, apicibus bifidis; stigmatibus 3-lobis 2/3 ad basem; baccis rubris. (PLATE 328, FIG. e.)—SZECHWAN, CHINA: Baurong to Tachienlu, via Hadjaha, alt. 9000–15500 ft., May–June, 1929, *Herbert Stevens*, no. 422 (TYPE in Herb. Field Museum); Tachienlu to Sachou, via Mouping, alt. 9200–12200 ft., August–September, 1929, *Stevens*, no. 80 (Field). The following probably belongs here: western Szechuan, *E. H. Wilson*, no. 4663 (Gray).

While the leaves of this species are very similar to those of *S. amplexifolius*, the floral characters place it unquestionably as a close relative of *S. roseus*. *S. roseus* and *S. obtusatus*, then, stand out as one more pair of closely related but very distinct species, one appearing in North America, and the other in Asia.

Fruiting specimens may be mistaken for *S. amplexifolius*, from which they may be distinguished by their uppermost leaves, which are not cordate and are somewhat oblique at base, rather than clasping and essentially equal at base as in *S. amplexifolius*. The leaf-margins

have 28–40 teeth per centimeter, more than are found in any form of *S. amplexifolius* except var. *oreopolus*.

5. S. ROSEUS Michx. Fl. Bor.-Am. i. 201 (1803).

The fact that all Wisconsin specimens identified as *S. roseus* which show underground parts have long rootstocks, the character of *S. longipes,* has led to a consideration of other possible distinctions between these two so-called species. Such characters have been sought in rootstocks, branching of stem, ciliation of leaves, the peduncles and pedicels, perianth, pistil and stamens, and fruit and seeds. *S. longipes* appears to be intermediate between *S. roseus* and the western *S. curvipes* and the writer is led reluctantly to the conclusion that these three plants intergrade to such an extent that they cannot be maintained as species.

ROOTSTOCKS. It was because of its slender and wide-creeping rootstock that *S. longipes* was first separated from *S. roseus.* F. C. Gates, studying the plants in the field in northern Michigan (Lower Peninsula) states[1] that the "length, thickness, branching and abundance of roots varied to both extremes with the variation in the character of the soil from good hardwood to pine land soil." While driving from Thessalon, Ontario, through Sault Ste. Marie and into the Upper Peninsula of Michigan, on September 11, 1932, the present writer had opportunity to observe the behavior of rootstocks in a region where the ranges of *S. roseus* and *S. longipes* overlap (see MAP 3). PLATE 328, FIG. a, shows a rootstock from this region which is of the *S. roseus* type; this is a close match for specimens collected by the writer in Maine. FIG. b shows another rootstock from the same region; this is clearly the *S. longipes* type, found from Michigan westward. But the identity of the plant shown in FIG. c is not so obvious, although some other plants in the same colony were much more like *S. longipes.* FIG. d illustrates another type of intermediate, in which the rootstock has been of a *roseus* type for some years, but is abruptly taking on the character of *S. longipes.* It may be noted here that in the Flora of the State of Washington *S. curvipes* is reduced outright to *S. roseus,* with the comment, "The western form of this species is commonly smaller than that of the eastern States, and shows a tendency to produce longer rhizomes, but we believe these differences are not specific, especially as rhizomatous forms occur also in the Allegheny Mountains."[2] We may conclude, then, that the plant of the middle west has

[1] RHODORA xiii. 237 (1911).

[2] Piper, Contrib. U. S. Nat. Herb. xi. 202 (1906). No plants with elongate rootstocks were found among the specimens from the Alleghenies examined in the present study.

a strong tendency to produce longer rootstocks than does the plant of the east, and whether or not this warrants specific recognition must be considered with its relation to other differences.

Branching of Stems. Here we find strong tendencies, but none sufficient for specific differentiation. *S. roseus* is usually branched, *S. longipes* often branched, and *S. curvipes* rarely branched. Dr. Butters writes me from Minnesota: "Of the specimens at hand 95% of the *curvipes* is unbranched, 54% of the *longipes*, and only 20% of true *roseus*." The following data, approximating those of Dr. Butters, were derived from the material in the herbaria of the University of Wisconsin, the New York Botanical Garden, the United States National Museum, and the University of Montreal.

	S. roseus, 196 plants.	S. longipes, 74 plants.	S. curvipes, 91 plants.
Simple	13%	62%	96%
2-branched	31%	16%	4%
3-branched	39%	15%	
4-branched	15%	6%	
5-branched	1%	1%	
6-branched	1%		

These figures may be compared with those taken in single patches in the field. On July 2, 1933, a count was made on *S. roseus* about the Lake of the Clouds, on Mount Washington, New Hampshire. Again, 100 individuals of *S. roseus* were examined in pine woods at Whitefield, Maine, on August 3, 1933. *S. longipes* was studied in the Barron Hills, Rusk County, Wisconsin, where 100 plants were observed. The results may be compared in a table. In all cases only flowering individuals were counted.

	S. roseus Mt. Washington, N. H.	S. roseus Whitefield, Maine.	S. longipes. Barron Hills, Wisconsin.
Simple	18	11	52
2-branched	50	45	38
3-branched	30	32	9
4-branched	2	8	1
5-branched		3	
6-branched		1	

So, as was expected from the study of herbarium material, the individuals of *S. roseus* in woods at low altitudes proved to have a tendency to branch more than those in the alpine regions of Mt. Washington, but even the latter were more freely branching than those of *S. longipes* growing in the woods.

Ciliation of Leaves. Here we find strong tendencies, but no clear-cut distinctions. In *S. roseus* the number of cilia per centimeter varies from 30 to 50, but on occasional plants they may run as low as 22 or as high as 60 per centimeter. The best way to observe this is with a binoccular microscope, a strip of black paper one centimeter wide being inserted under a loose leaf-edge. In *S. longipes* there are rarely more than 30 cilia per centimeter, although on a few plants, otherwise characteristic, they reach 38 per centimeter, or even 60 per centimeter in some; they may be as sparse as 14 per centimeter. The average number in *S. roseus* is about 34, and in *S. longipes* about 25.

In *S. curvipes* they are usually less abundant. The length of the cilia, while so variable as to have little diagnostic value, is seldom over 0.3 mm. in *S. roseus*, and often reaches 0.4 or 0.5 mm. in *S. longipes*. In *S. curvipes* they are usually much shorter than in *S. roseus*.

Peduncles and Pedicels. These are very variable, their combined length being sometimes as little as 5 or 6 mm. in all the species, but the upper limit of variation is much less in *S. curvipes* than in the others.

Perianth. In the venation of the perianth-segments seems to lie one of the most satisfactory distinctions between the so-called species. In *S. roseus* the sepals are 9–11-nerved (rarely only 7-nerved) and the petals are 7-nerved, while in *S. longipes* and *S. curvipes* the sepals are 5–7-nerved and the petals are 3–5-nerved. But occasional exceptions may be found, when plants otherwise agreeing with *S. longipes* have 9-nerved sepals. Also, if flowers of *S. longipes* are boiled and observed with transmitted light, many small branch-nerves appear; thus, a petal from a plant collected by the writer at Merrimac, Wisconsin, is when dry distinctly 5-nerved, but after boiling it shows with transmitted light eleven nerves of varying lengths.

Another perianth character has been called to my attention by Dr. Butters. In *S. longipes* and *S. curvipes* the inner surface of the perianth-segments almost always has copious short papilla-like hairs (plate 328, fig. k), longer in *S. curvipes* than in *S. longipes*. These are rarely developed in *S. roseus*, which sometimes has what appear to be, in dried flowers, appressed or elongate very fine hairs. Under the microscope these appear as long low papillae (plate 328, fig, j). But a series of specimens collected by the writer in Rusk County, Wisconsin, while having characteristic *longipes* rootstocks, have the many-veined and non-papillate perianth-segments of *S. roseus*, and numerous

other exceptions have been noted on several herbarium sheets. Professor Butters has also pointed out to me that the stamens of *S. longipes* are usually 3/5 to 2/3 the length of the perianth-segments, while those of *S. roseus* are ordinarily only about ½ the length of the perianth-segments; however, the number of exceptions is so great as to destroy the value of this as a really diagnostic character.

Pistils and Stamens. Here, Dr. Butters has pointed out to me two tendencies. The bases of the filaments, which are in all cases fused with the perianth, are in *S. roseus* often fused with each other, and are less often so in *S. longipes*. Well developed stigmas are usually more widely spreading in *S. longipes* than in *S. roseus*.

Fruit and Seeds. The seeds are, as far as the writer can determine, identical in *S. roseus, S. longipes,* and *S. curvipes*. As for the fruits, Gates distinguishes *S. longipes,* with berry subglobose in general shape and triangular in cross-section with very obtuse angles, from *S. roseus,* with more or less globose fruit which is circular in cross-section.[1] It is, of course, impossible to tell from pressed specimens how generally this holds. The writer has berries preserved in alcohol, representing the following collections: *S. longipes:* Parfrey's Glen, Merrimac, Wisconsin, July 16, 1932, *N. C. Fassett,* no. 14381; same location, July 24, 1932, no. 14382. *S. roseus:* Ocean Point, Maine, July 28, 1932, *Mrs. L. J. Fassett & Ellen Denike;* Ocean Point, Maine, August 4, 1932, *Josephine W. Chute;* White Island, Boothbay, Maine, July, 1933, *J. H. Fassett;* Garden River, Ontario, August 20, 1932, *N. C. Fassett,* no. 14700. In all of these the berries are triangular in cross-section when young, becoming more turgid as they mature; those of *S. roseus* appear to be more turgid than those of *S. longipes*. There should be more observation of this character in the field, and more herbarium specimens should be accompanied by preserved fruits.

S. longipes, then, resembles *S. roseus* in the length of cilia on the leaves; it is intermediate between *S. roseus* and *S. curvipes* in branching and the amount of ciliation on the leaves; and it resembles *S. curvipes* in the rootstock and the perianth. In view of these facts, these plants seem best treated as three geographic varieties of one species.

Since the categories in which we place plants are to a great extent but human conceptions and rest on individual opinions, I may be pardoned if I introduce some personal experiences. In the summer of

[1] Rhodora xiii. 237 (1911).

1931 I studied this group in the Gray Herbarium, and came to the conclusion that *S. roseus* and *S. longipes* were two perfectly distinct species, separable on a number of characters, and with ranges that did not overlap. Later, a study of more ample material from the middle west convinced me that this idea was incorrect. In 1911 Professor F. C. Gates wrote as follows: "Accordingly *Streptopus longipes* has demonstrated its specific validity and to its description should be added the words: fruit subglobose, trigonous in cross-section with obtuse angles."[1] On December 12, 1932, Professor Gates wrote to me as follows: "In reply to your letter regarding *Streptopus longipes:* in the early days of the station [at Douglas Lake, Cheboygan County, Michigan], *Streptopus* was present in many of the beech-maple forests. We found specimens which had the root character what Fernald used in describing *Streptopus longipes* together with the trigonous fruit character. We found other plants which had an entirely different root character with globose fruits. In those days, we considered the one with trigonous fruit as *Streptopus longipes* as the root character usually, but not always, agreed with that. As time has gone on, the forests have been lumbered and at present there are not sufficient data in the Douglas Lake region to give one any satisfaction regarding what is what. We have felt that if the two are separate species, they have hybridized and succeeding generations have broken up in different ways, which would explain the differences in combination of these two characters. As I have not had any opportunity to study *Streptopus* except in the Douglas Lake region, I really cannot answer your question at the present time. It could, of course, be that farther west, one is present without the other, and it could be that there is only one species which varies under different conditions. At the Biological Station of late years, we have been inclined more toward the latter explanation than the former, but as I said before, will have to admit that the widespread destruction of the forests has resulted in the dying off of *Streptopus* and we find insufficient data to settle the question."

It is a pleasure to acknowledge the coöperation of Professor F. K. Butters, who has pointed out a number of distinctions between *S. roseus* and *S. longipes*, as has already been mentioned. Like the present writer, he at first considered that they were very distinct species, but on February 1, 1933, after we had both made a thorough study of the material in the herbaria of the University of Minnesota

[1] Rhodora xiii. 237 (1911).

and of the University of Wisconsin, Dr. Butters wrote me as follows: "Now as to the taxonomy of the two forms, it seems to me that they are just about on the border line between species and varieties. . . I am not much worried about the undoubted intermediates that occur in Michigan. It seems to me that these are best explained as the result of recent hybridity between the two entities, where their gradually extending ranges have overlapped. I don't think such intergrades occurring in a limited district are sufficient in themselves to reduce the intergrading forms to the status of varieties rather than species. More troublesome is the fluctuating and apparently unfixed condition of most of the characters. All things considered I am inclined to think your disposition of them is best. Of course, whatever you do with *S. longipes* will have to be done also with *S. curvipes.* Those two forms are very closely related, I think more closely than either is related to true *S. roseus.* . . . Isn't this another case of the relationship of plants of the general Lake Superior region with those of the northern Cordillera?"

In the preceding paragraphs, the names *S. roseus*, *S. longipes*, and *S. curvipes*, have been used for the common plants of the eastern states, the middle west, and the far west, respectively. In the seventh edition of Gray's Manual the range of *S. longipes* is limited to one county in Upper Michigan; this is too restricted, for it occurs in Minnesota, Wisconsin and much of Michigan, to the exclusion of *S. roseus.*

A fourth phase of this group occurs in the southern Alleghenies, where many of the plants have perfectly glabrous peduncles and pedicels (flower stalks, if not branching, usually bear near the middle a little callus; the part above this callus is considered to be pedicel, and below it peduncle). The habitat of *S. roseus* as given by Michaux ("in excelsis montibus Carolinae septentrionalis et in Canada") suggests that the type of the species may be the glabrous-peduncled plant. This possibility is heightened by Michaux's plate illustrating this species, for a plant with glabrous pedicels and peduncles is shown. However, this plate is so inaccurate, showing no ciliation on the leaves, and twisted flower-stalks like those of *S. amplexifolius*, that it seems best to leave it out of consideration. An illustration of a little later date[1] also shows glabrous flower-stalks, with ciliate leaves.

The question of the identity of the plant of Michaux is solved by a letter to the writer from M. François Pellegrin, in which he says:

[1] Lodd. Bot. Cab. xvii. t. 1603 (1830).

"l'échantillon de *Streptopus ciliatus*[1] de l'herbier Michaux a les péduncules et pédicelles entièrement glabres." The local plant of the southern mountains must, then, be taken up as type, and the more wide-spread phase taken up as a new variety.

S. ROSEUS Michx., var. **typicus**. *S. roseus* Michx. Fl. Bor.-Am. i. 201 (1803), excluding reference to Canadian plant. PLATE 328, FIGS. g & i; MAP 3, crosses.—VIRGINIA: south slope of White-top Mt., May 28, 1892, *E. W. Cathcart* (U. S.); summit of White-top Mt., Washington County, May 28, 1892, *N. L. & E. G. Britton & Anna M. Vail* (N. Y.); northeast slope of White-top Mt., Smythe County, May 28–29, 1892 (Field). NORTH CAROLINA: Grandfather's Mountain, altitude 5000–5800 ft., July 10–12, 1925, *P. A. Rydberg*, no. 9342 (N. Y.); Roan Mountain, June, 1878, *M. E. Hyams* (N. Y.); Roan Mountain, June, 1879, *A. Gray, C. S. Sargent, J. H. Redfield & W. M. Canby* (Gray). The following specimens are intermediate between this and the next variety: PENNSYLVANIA: Conashaugh, July 6, 1890, *N. L. Britton* (N. Y.). VIRGINIA: north-east slope of White-top Mountain, Smythe County, altitude 4000–5000 ft., May 28–29, 1892, *J. K. Small* (U. S.; Field). NORTH CAROLINA: Richland Balsam Mt., Haywood County, 5000 ft. altitude, May 21, 1911, *H. D. House*, no. 4574 (U. S.); Roan Mountain, 1894, *Dr. H. A. Edson* (U. S.); summit, 6300 ft., Roan Mountain, July 15, 1880, *John Donnell Smith* (U. S.); along streams on northern slopes of Craggy Mountain, Buncombe County, May 25, 1897, *Biltmore Herbarium*, no. 4665 (U. S.; N. Y.); along mountain streams near Highlands, Macon County, May 24, 1897, *Biltmore Herbarium*, no. 4665b (N. Y.); high mountains of North Carolina, June, 1868, *Wm. M. Canby* (U. S.); ravines, 3500 ft. altitude, "Pink Beds," Pisgah Forest, Transylvania County, May 8, 1909, *H. D. House*, no. 4142 (U. S.).

The line between var. *typicus* and var. *perspectus* is drawn at perfectly glabrous pedicels rather than to include in the former variety those plants with much reduced ciliation because such nearly glabrous ones are occasionally found throughout the range of var. *perspectus*, while completely glabrous ones seem to be confined to the southern mountains.

Among the tendencies shown by individuals of *Streptopus roseus* from the southern Alleghenies is a lack of cross-veins in the leaves in many plants. But since this is not universal in the region, and is occasionally found in other parts of the range of *S. roseus*, it is here recognized with no more than this note.

S. ROSEUS, var. **perspectus**, n. var., rhizomate cum internodiis curtissimis (PLATE 328, FIG. a); pedunculis pedicellisque ciliatis (FIGS. f.

[1] The type specimen, in the herbarium of Michaux, is marked *Streptopus ciliatus; roseus* has been written on the label by another's hand. See Victorin, Contrib. du Lab. de Bot. de l'Univ. de Montréal xiv. 24 (1929).

& h); sepalis (7–) 9–11-nervis; sepalis petalisque intra non papillatis (FIG. e).—Southern Labrador, Newfoundland, and Quebec to northern New Jersey and western Pennsylvania, southward in the mountains to Virginia, Tennesee, and North Carolina (where it intergrades with the preceding), Georgia (according to Chapman), westward through southern Ontario to central Michigan and the eastern extreme of the Upper Peninsula of Michigan, where it intergrades with var. *longipes*. (MAP 3, circles).—TYPE in the Herbarium of the University of Wisconsin: under trees, floor of Tuckerman's Ravine, Mt. Washington, New Hampshire, June 27, 1934, *N. C. Fassett*, no. 16422.

S. ROSEUS, var. PERSPECTUS, f. **giganteus**, n. f., caulis crassus; sepalis 10–12 mm. longis; staminibus 5–7 mm. longis; aristis antherarum 0.5–1.0 mm. longis; stigmatibus 1.1 mm. longis.—Talus de l'escarpment, avec *S. amplexifolius* & *S. oreopolus*, Ile Nue, Archipel de Mingan, Québec, 28 juillet 1926, *Victorin & Rolland*, no. 24336 (TYPE in the Herbarium of the University of Montreal).

This collection is unique among those studied by the writer, in that the stems are a centimeter thick (when pressed) below the first branching, and the floral parts are much larger than those of the ordinary plants. It appears to be a polyploid of the nature of *Oenothera gigas*. There are two sheets in the herbarium of the University of Montreal, and one in that of the University of Wisconsin, bearing this number; all are f. *giganteus*, while other collections from the same locality bear flowers of normal size.

S. ROSEUS, var. **longipes** (Fernald), n. comb. *S. longipes* Fernald, RHODORA viii. 71 (1906).—Southern Ontario, northwestern Pennsylvania,[1] northern Michigan and Wisconsin to western Minnesota and southern Manitoba (MAP 3, small dots).

S. ROSEUS, var. **curvipes** (Vail), n. comb. *S. curvipes* Vail, Bull. Torr. Bot. Cl. xxviii. 267 (1901). *S. roseus* Piper, Contrib. U. S. Nat. Herb. xi. 202 (1906). *S. brevipes* Fernald, RHODORA viii. 69 (1906), not Baker. (PLATE 328 FIG. k).—Alaska to southeastern British Columbia and northern Oregon (MAP 3, *x*'s).

6. S. STREPTOPOIDES (Ledeb.) Frye & Rigg, Northwest Flora 109 (1912). *Smilacina streptopoides* Ledeb. Fl. Ross. iv. 128 (1853). *Kruhsea Tilingii* Regel ex Regel & Tiling, Fl. Ajanensis 122 (1858). *Streptopus ajanensis* Tiling ex Regel & Tiling, l. c. (*nomen nudum*).

Within the eastern Asiatic and western North American *S. streptopoides* we find a series of variations very similar to those within *S. roseus*. The following treatment must be considered as provisional; the final understanding of the Asiatic plants must rest upon a study of a large series of specimens and upon field observation.

S. STREPTOPOIDES, var. **verus**. *Smilacina streptopoides* Ledeb. l. c.

[1] Specimens seen at Carnegie Museum since MAP 3 was engraved.

Specimens seen: SIBERIA: Ayan, Ochotsk Sea, *C. Wright* in 1853–56 (Gray, U. S.); Ayan, *Tiling* (Gray).

S. STREPTOPOIDES, var. **brevipes** (Baker), n. comb. *S. ? brevipes* Baker, Journ. Linn. Soc. xiv. 592 (1875). *Kruhsea Tilingii* Baker, l. c., 593 in part. *K. Tilingiana* Farr, Contrib. Bot. Lab. Univ. Pa. ii. 417 (1904).—Alaska to Washington, east to Idaho and southeastern British Columbia.

PLATE 328, FIG. n, shows the characteristic rounded hyaline cells of the leaf-margin. While considerable magnification is required to see this, it is quite unmistakable and does not occur elsewhere in the genus.

The name *S. brevipes* has sometimes been applied to *S. roseus* var. var. *curvipes;* a specimen in the Gray Herbarium, Cascade Mts., 49 N. Lat., 1859, *Dr. Lyall*, appears to be the type, and while it is in fruit, its leaf character places it unquestionably with *S. streptopoides*.

S. STREPTOPOIDES, var. **japonicus** (Maxim.), n. comb. *S. ajanensis*, var. *japonica* Maxim. Mel. Biol. xi. 856 (1883); Matsumura, Ind. Pl. Jap. 214 (1905). *S. japonicus* Ohwi, Tokyo Bot. Mag. xlv. 189 (1931). *S. streptopoides* Matsum. Ic. Pl. Koisikav. i, pl. 54 (1912), which represents the larger forking plant without long rootstocks.—Northern Japan and Yezo.

S. STREPTOPOIDES, var. ATROCARPUS Matsum. l. c., p. 107. *S. japonicus*, var. *atrocarpa* Ohwi, Tokyo Bot. Mag. xlv. 189 (1931).

The relation of this to var. *japonicus* could not be determined from the material at hand. All the Japanese specimens of *S. streptopoides* studied were of the stout branched type; some had a long rootstock like that shown in PLATE 328, FIG. b, while others had a short rootstock like that in FIG. a. The color of the berry was not distinguishable.

7. S. KOREANUS (Komarov) Ohwi, Tokyo Bot. Mag. xlv. 189 (1931). *S. ajanensis*, var. *Koreana* Komarov, Fl. Mansh. i. 476 (1901); Nakai, Fl. Koreana ii. 246 (1911).—Specimen studied: flum. Jumin-gan, Korea septentrionalis, July 13, 1897 (styl. vet.), *V. Komarov*, no. 407 (Gray; N. Y.).

KEYS FOR LOCAL USE

A few keys are here presented which may be of use in identifying specimens from various parts of North America.

For the area from Labrador and western Quebec southward:

a. Nodes glabrous; leaves clasping at base; fruit elongate; perianth-segments widely spreading or recurved *b*
b. Leaves whitened beneath, their margins entire or essentially so; peduncles and pedicels always glabrous; perianth greenish white; fruit scarlet........*S. amplexifolius* var. *americanus.*
b. Leaves green beneath, their margins denticulate to ciliate; peduncles and pedicels often ciliate; perianth deep red; fruit cherry-red....................*S. amplexifolius* var. *oreopolus.*

a. Nodes fringed; leaves not clasping; fruit globose; perianth-segments not recurved *c*
c. Pedicels, and often the peduncles, glabrous........*S. roseus* var. *typicus.*
c. Pedicels and peduncles ciliate *d*
d. Stem rarely more than 5 mm. thick at the first branching; perianth 6–10 mm. long................*S. roseus* var. *perspectus.*
d. Stem 1 cm. or more thick at the first branching; perianth 10–12 mm. long..............*S. roseus* var. *perspectus* f. *giganteus.*

For Ontario, Manitoba, Michigan, Wisconsin and Minnesota:

a. Nodes glabrous; leaves clasping at base, their margins entire or minutely denticulate; perianth-segments widely spreading or recurved *b*
b. Leaf-margins entire or with fewer than 10 teeth per centimeter..........................*S. amplexifolius* var. *americanus.*
b. Leaf-margins with 10–25 teeth per centimeter. *S. amplexifolius* var. *denticulatus.*
a. Nodes fringed; leaves not clasping, their margins copiously ciliate; perianth-segments not recurved except at tip *c*
c. Rootstock with crowded nodes; leaf-margins with usually more than 30 cilia per centimeter; sepals (7–)9–11-nerved, not papillate within................*S. roseus* var. *perspectus.*
c. Rootstocks with internodes several centimeters in length; leaf-margins with usually less than 30 cilia per centimeter; sepals 3–5-nerved, minutely papillate within. *S. roseus* var. *longipes.*

In the area from Montana to New Mexico, west to the continental divide and east to South Dakota, will be found only *S. amplexifolius*, occurring as two varieties: var. *chalazatus* has the leaves minutely papillate beneath, while var. *americanus* does not. The writer is not familiar with these in the field, but from a study of herbarium material it appears that they may grow together. Observers in this region may discover some differences in habit, fruit or habitat.

For the west slopes of the Rockies to the Pacific coast:

a. Large usually branching plants often reaching a meter in height; nodes glabrous; perianth-segments spreading from about the middle *b*
b. Leaf-margins entire or with not more than 10 minute teeth per centimeter *c*
c. Leaves papillate beneath............*S. amplexifolius* var. *chalazatus.*
c. Leaves not papillate beneath.......*S. amplexifolius* var. *americanus.*
b. Leaf-margins with 10 or more teeth per centimeter. *S. amplexifolius* var. *denticulatus.*
(Vars. *grandiflorus* and *papillatus* occur locally)
a. Small rarely branching plants seldom more than 3 dm. high; nodes fringed; perianth campanulate or rotate *d*
d. Perianth campanulate; leaf-margins with multicellular irregularly spaced cilia or entire..............*S. roseus* var. *curvipes.*
d. Perianth rotate; leaf-margins with microscopic unicellular hyaline closely crowded teeth........*S. streptopoides* var. *brevipes.*

Explanation of Plate

Fig. a, Streptopus roseus var. perspectus, rootstock × ½, from Garden River, Ontario, *Fassett*, no. 14655 (U. of Wis.). Fig. b, S. roseus var.

LONGIPES, rootstock × ½, from Blaney, Michigan, *Fassett*, no. 14663 (Gray). FIG. c, S. ROSEUS, rootstock intermediate between vars. PERSPECTUS and LONGIPES, × ½, from Nestorville, near Thessalon, Ontario, *Fassett*, no. 14660 (U. of Wis.). FIG. d, S. ROSEUS, rootstock showing characters of both var. PERSPECTUS and var. LONGIPES, × ½, from Pickford, Michigan, *Fassett*, no. 14658 (Gray). FIG. e, S. OBTUSATUS, flower, pedicel and peduncle, × 1½, from Szechuan, China, *Stevens*, no. 422; the black strip is 1 cm. wide. FIG. f, S. ROSEUS var. PERSPECTUS, flower, etc., × 1½, from Hanover, New Hampshire, *J. H. Fassett* (U. of Wis.); the black strip is 1 cm. wide. FIG. g, S. ROSEUS var. TYPICUS, flower, etc., × 1½, from White Top Mountain, Virginia, *Britton, Britton & Vail* (N. Y.); the black strip is 1 cm. wide. FIG. h, S. ROSEUS var. PERSPECTUS, flower, young fruit, etc., × 1½, from Labrador, *A. W. Hale* (N. Y.); the black strip is 1 cm. wide. FIG. i, S. ROSEUS var. TYPICUS, × 1½, from Roan Mountain, North Carolina, *John Donnell Smith* (U. S.); the black strip is 1 cm. wide. FIG. j, S. ROSEUS var. PERSPECTUS, inner surface of sepal, × 15, from Peacham, Vermont, *Blanchard* (Field). FIG. k, S. ROSEUS var. CURVIPES, inner surface of sepal, × 28, from Wellington, Washington, *Cameron & Lanocker* (Field). FIG. l, S. AMPLEXIFOLIUS var. CHALAZATUS, lower surface of leaf, × 7½, from Wallowa Lake, Oregon, *H. P. Hansen*, no. 1100 (U. of Wis.). FIG. m, S. AMPLEXIFOLIUS var. DENTICULATUS, lower surface and margin of leaf, × 7½, from Cascade Mountains, Washington, *J. M. Grant* (U. of Wis.); the white lines are 1 mm. apart. FIG. n, S. STREPTOPOIDES var. BREVIPES, leaf-margin, × 45, from Kelp Bay, Alaska, *Mr. & Mrs. E. P. Walker*, no. 804 (N. Y.). FIG. o, S. AMPLEXIFOLIUS var. AMERICANUS, leaf-margin, × 15, from Temiscouata County, Quebec, *J. F. Northrup*, no. 185 (N. Y.); the white lines are 1 mm. apart. FIG. p, S. AMPLEXIFOLIUS var. DENTICULATUS, leaf-margin, × 15, from Yakutat Bay, Alaska, *Funston*, no. 61 (N. Y.); the lines are 1 mm. apart. FIG. q, S. AMPLEXIFOLIUS var. OREOPOLUS, leaf-margin, × 15, from Tabletop Mountain, Quebec, *Fernald & Collins*, no. 197a (N. Y.); the lines are 1 mm. apart. FIG. r, S. AMPLEXIFOLIUS var. DENTICULATUS, leaf-margin, × 15, from Multnomah County, Oregon, *H. H. Smith*, no. 3093 (N. Y.); the lines are 1 mm. apart.

NOTES ON THE DESMID FLORA OF NEW ENGLAND II.

DESMIDS FROM CAPE COD AND THE ELIZABETH ISLANDS[1]

GERALD W. PRESCOTT

Plates 329 and 330

NEW England is one of the most favorable regions in the United States, if not in North America, for an abundant desmid flora. The highly glaciated topography provides numerous ponds, kettle-holes, and swamps which are, for the most part, made permanent by an adequate rainfall. The climatic conditions and the acidity of the water (pH 5.0–6.8), draining igneous rock in many sections, assist in producing a flora not only rich in species but in number of individuals as well.

The region is the collecting ground for America's earliest algologists and although it has long been a favorite haunt of the desmid student much still remains to be learned of the flora here. At the time of

[1] Printed with aid to RHODORA from the National Academy of Sciences.

writing the ecology of desmids in New England has scarcely been touched upon in the literature. There is also the problem of geographical distribution to be considered. When more taxonomic data are obtained some significant and interesting comparisons with other floras should be forthcoming. As yet it cannot be stated whether or not the region is characterized by a distinct type of flora or group of species. However, some properly qualified generalizations can be drawn.

Many early published reports on the desmids of New England are disappointing and of little use to the taxonomist because descriptions of species are incomplete and also because they are not accompanied by figures, or at best only by vague illustrations that leave altogether too much to the imagination. Again, several papers that do involve adequate figures have been published in foreign journals and are not readily accessible. The writer wishes to make a contribution by way of furnishing notes and illustrations for new species of desmids or forms new to the region, and also for those which have been inadequately or never figured for New England.

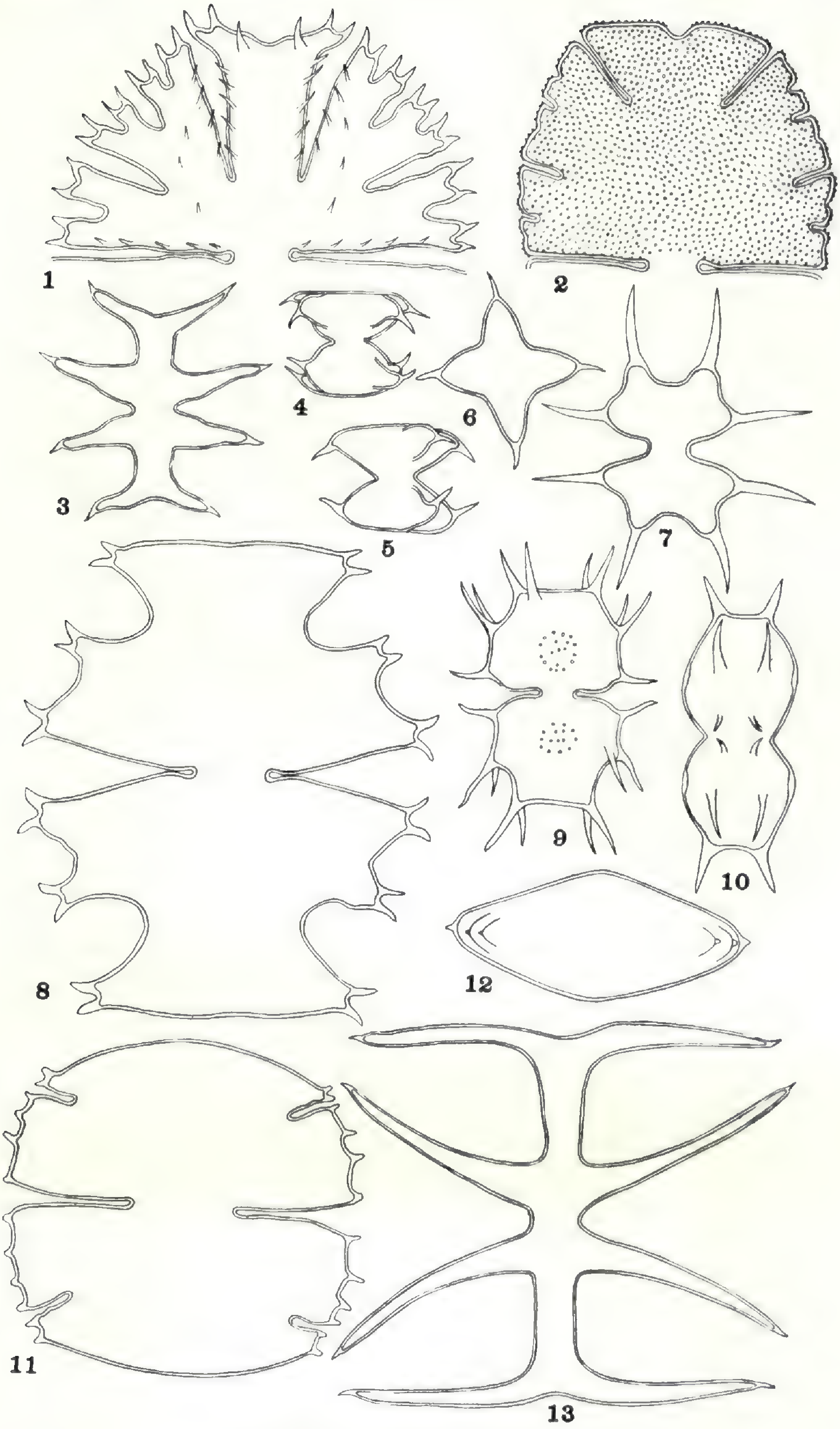
The forms mentioned below are from the author's collections made on Cape Cod and the Elizabeth Islands during the summers of 1932 and 1933 while stationed at the Marine Biological Laboratory. The type of habitat which contributed the greatest variety and number of individuals was the shallow pond with a sphagnum-bog margin. The ooze at the edge of such a pond or the squeezings from *Sphagnum* yielded a most amazing and delightful variety of species.

Plankton species on the other hand were found to be relatively scarce. It is noteworthy that, so far as studies have been made, the species of desmids in this area, and apparently throughout all of New England, make up a flora that is more comparable with that of Newfoundland and northern Europe than with that of Wisconsin and the central Canada region. This is particularly true for plankton species. It is to be expected of course that many forms are found which are of universal distribution. However, the appearance in New England of a large number of species found in Europe and England and not in west and mid-west North America indicates a significant distribution.

The author is grateful for the helpful suggestions of Dr. W. R. Taylor and also for the facilities provided by the Marine Biological Laboratory.

XANTHIDIUM Ehrenberg, 1837.

XANTHIDIUM CRISTATUM de Breb. var. UNCINATUM de Breb. Smith, Wis. Geol. Nat. Hist. Surv. Bull. **57** (II): 60, Pl. 66, f. 4. 1924.



Desmids of New England

Forma. Width 32.0 μ without spines, 49.0 μ with spines; length 49.0 μ without spines, 67.4 μ with spines. Pl. 329, F. 9, 10.

The plant figured shows an unusual condition in which there is a pair of spines rather than one at the basal angles of the semicell. These show in the side view (f. 10). If this is a constant feature the variation should be given a form name but only the one specimen has been found.

Typical form previously reported from New England by Cushman in New Hampshire and from Maine by W. West. Pasque Island.

Arthrodesmus Ehrenberg, 1838.

Arthrodesmus impar (Jacobs.) Grönblad, Acta Soc. pro Fauna et Flora Fennica **49**, No. 7:55, Pl. 3, f. 58–60. 1921.—Width 26.4 μ without spines, 59.4 μ with spines; length 29.7 μ without spines, 66.0 μ with spines. Pl. 329, f. 7.

Except for Taylor's record (25) from Newfoundland this interesting plant has not been previously reported from North America. Pond near Falmouth, Cape Cod.

Staurastrum Meyen, 1829.

Staurastrum elongatum Barker. West and West, British Desmidiaceae V: 156, Pl. CLI, f. 2–5.—Semicell cyathiform with 3 rows of granules across the swollen base immediately above the isthmus. Width 48.0 μ; length 65.0 μ. Pl. 330, f. 8—Fla., Pa., Mich., Newfoundland (Taylor (26)). Pond near Falmouth, Cape Cod.

Staurastrum concinnum West and West, Jour. Linn. Soc. Bot. **33**: 317, Pl. 18, f. 17. 1897.—Semicells fusiform, gradually tapering into arms bearing three strong spines at their apices, dorsal margin of arm with three small spines; with a row of 6 bifurcate processes across the apex, below each one of which is a triangular-shaped verruca; ventral margin of semicell with 5–6 simple (sometimes bifurcate) spines on each arm; vertical view triangular, the angles extended into rather long arms that are tri-spinate, the margins furnished with a row of bifurcate processes, longer and much stouter midway between the apices of the arms; central region smooth. Width 57–66.0 μ including spines; length 34–45.0 μ including spines. Pl. 330, f. 3, 4.—Conn., N. H., Fla. Pond near Falmouth, Cape Cod.

This plant shows some variations in our collections, especially in vertical view, when they are compared with the figures of Hylander and the Wests. It should be compared with *St. vestitum* Ralfs and *St. ornithopodum* West and West, Trans. Linn. Soc. Bot. 5: Pl. 17, f. 18–20.

Staurastrum furcatum (Ehr.) de Breb. West and West, British Desmidiaceae V: 173, Pl. CLV, f. 1–4.—Width 30.0 μ; length 39.0 μ

including arms; isthmus 9–10.0 μ. Pl. 330, f. 12, 13.—Swamp near Chatham, Mass., Wis., Mich., Iowa, Newfoundland, Maine, Minn.

Staurastrum glabrum (Ehr.) Ralfs. West and West, British Desmidiaceae V: 2, Pl. CXXIX, f. 2–5; Trans. Linn. Soc. Bot. Ser. 2, **5**: 255, Pl. 16, f. 8.—Width 24.7 μ without spines, 34.2 μ with spines; length 26.6 μ; isthmus 9.3 μ. Pl. 329, f. 4–6.

Although a variety has been reported from North America by the Wests (l. c.) and the typical form in Michigan by Nichols and Ackley (18) this plant has not been figured in American literature apparently. I have found it in but one locality, a pond on Nonamessett Island. The specimens were all 4- rather than 3-angled.

Staurastrum striolatum (Naeg.) Archer. West and West, British Desmidiaceae IV: 177, Pl. CXXVII, f. 1–5.—Width 21.0 μ; length 20.0 μ; zygospore 39.0 μ in diameter, 23.0 μ thick, circular in one view with about 12 undulations at the margin, side view oblong. Pl. 330, f. 9, 10.—Swamp near Hyannis. Generally distributed.

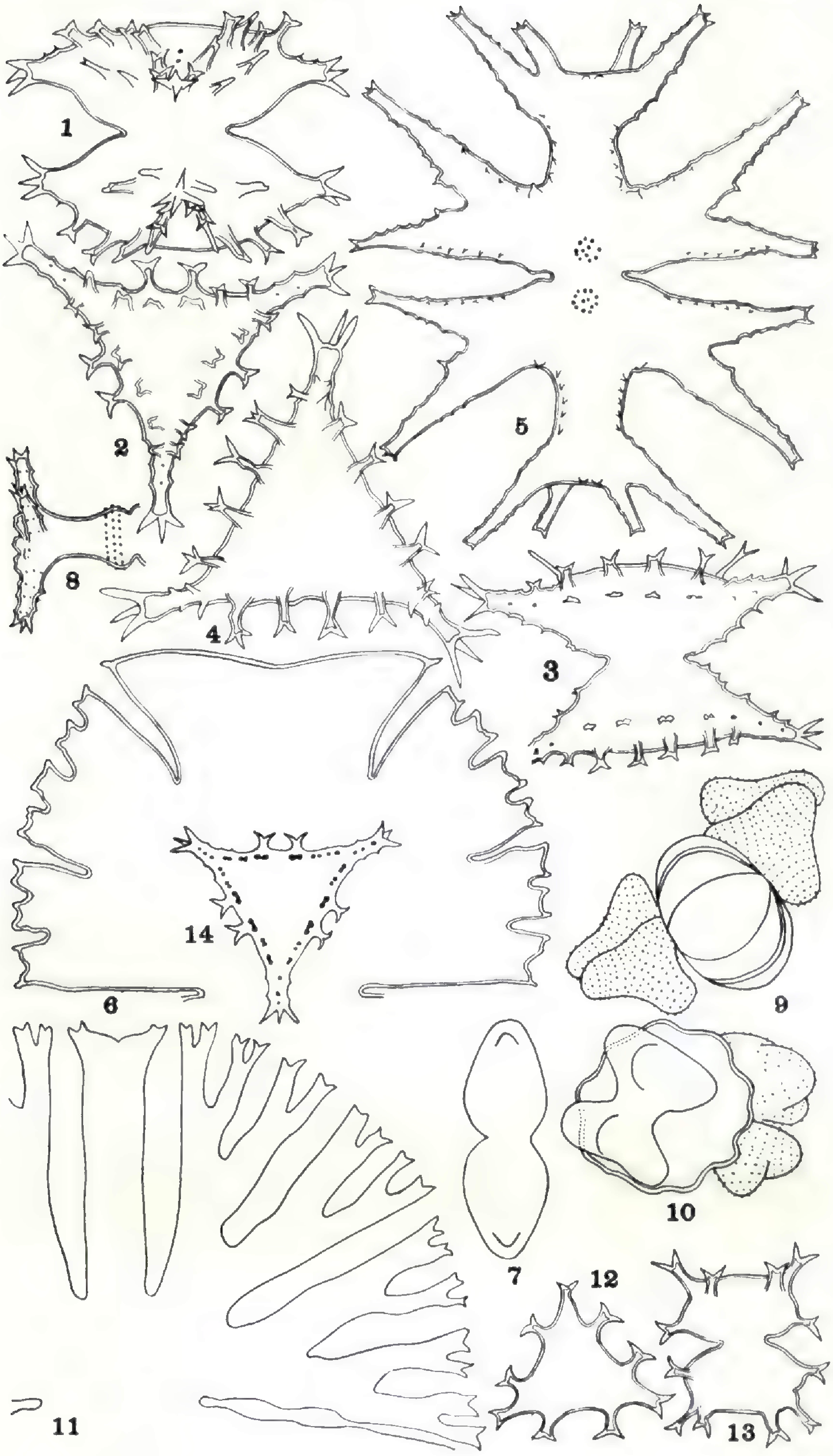
This characteristically shaped zygospore apparently has not been previously reported or figured for North America.

Staurastrum vestitum Ralfs. West and West, British Desmidiaceae V: 158, Pl. CLI, f. 9–11; Pl. CLII, f. 5–6.

Forma. Sinus open; semicells broadly subfusiform, apical margin slightly convex, showing eight bifurcate processes arranged (4 each) in two linear series extending from the apices of the lateral arms to the apex of the forwardly directed third arm of the semicell; below these two series two emarginate or simple processes on either side of the semicell; in vertical view triangular, the angles extended into tridenticulated processes, each margin furnished with 2 rather stout bifurcate processes, within each margin a series of 6 emarginate verrucae which may be elongated into processes. Width 46.2 μ; length 25–27.0 μ including processes. Pl. 330, f. 1, 2, 14.—Pond near Falmouth.

The chief difference between this form and the typical shows in vertical view, the marginal series of emarginate granules being replaced by coarse verrucae and bifurcated processes. The New England specimens bear out the remarks of Wests (l. c., p. 159) relative to the variability of this species. Very typical forms were found with the usual series of emarginate granules which were coarse and very prominent opposite the pair of marginal processes as seen in vertical view. Pl. 330, f. 14.

St. vestitum and its varieties have been found in many places in North America with New England records from Maine and Conn. The figure of Brown (3), Pl. 14, f. 93, certainly must be a form of var. *subanatinum* W. and G. S. West and not the typical.



Desmids of New England

MICRASTERIAS Agardh, 1827.

MICRASTERIAS ARCUATA Bailey, Smithsonian Contributions to Knowledge 2. 1851.

Var. GRACILIS West and West, Trans. Linn. Soc. London, Ser. 2, **5**: 238, Pl. 13, f. 27.—Width 70.0 μ; length 105.8 μ; isthmus 9–10.0 μ. Pl. 329, f. 13.—Swamps near Falmouth and Hyannis; Elizabeth Islands.

This elegant variety is distinguishable by its more slender arms and by a width that is 30–50 per cent greater than its length. Originally described from Pennsylvania it has also been reported by the Wests from Florida and from Alabama by Brown (3). From a consideration of Brown's figure, Pl. 12, f. 22, the author is convinced that the Alabama specimen is of the type and not the variety designated. The width of the plant shown is scarcely greater than the length and the general proportions throughout do not suggest var. *gracilis*.

MICRASTERIAS DECEMDENTATA Naegeli. Homfeld, Pflanzenforschung **12**: 34, Taf. 4, Fig. 40.

? Var. TURGIDUS Taylor (26). Width 91.2 μ; length 89.3 μ; isthmus 19.0 μ. PL. 329, F. 11, 12.—Pond near Falmouth.

Our specimens are almost identical with a form that Taylor (26) questionably designates as a new variety. The very much inflated semicells as seen in vertical view is the character that distinguishes it from the typical.

MICRASTERIAS DEPAUPERATA Nordstedt. West and West, Trans. Linn. Soc. London Ser. 2, **5**: 238, Pl. 14, f. 1.—Width 131.4 μ; length 142.8 μ; isthmus 24.5 μ; polar lobe 94.1 μ wide. PL. 329, F. 8.—Swamps, Cape Cod.

Previously reported from Massachusetts by Cushman (4) and Lagerheim (15), but not figured. It is to be noted that in our specimens the sinus is closed near the apex, a character not shown in any of the published figures thus far seen.

MICRASTERIAS EXPANSA Bailey, Smithsonian Contributions to Knowledge 2. 1851.

Forma. Lateral lobes nearly horizontal, dorsal margin straight, ventral margin distinctly tumid; arms of apical lobe diverging; lateral lobes and arms of apical lobe proportionately longer and more slender than in the type; apices of all angles rounded and aculeate. Width 49–53.2 μ; length 49–53.2 μ; isthmus 8–9.7 μ; width of polar lobe 32–34.0 μ.—Pond near Falmouth; swamps on Elizabeth Islands. PL. 329, F. 3.

M. expansa Bailey has been redescribed by Nordstedt as a variety of *M. arcuata* Bailey. However the expression known as *M. expansa* possesses some constant proportions of the semicell and other char-

acteristics which seem to qualify it as a distinct species. These are pointed out by Taylor (26).

In New England *M. expansa* has been previously reported by Cushman and Wolle and from Newfoundland by Taylor and Fogg (27). Distribution data for North America at present show this plant to be confined to the Atlantic coast region.

Micrasterias Jenneri Ralfs. West and West, British Desmidiaceae II: 86, Pl. XLII, f. 14; Pl. XLIII, f. 1, 2.—Width 107.5 μ; length 160.0 μ. Pl. 329, f. 2.—Swamp near Falmouth.

This plant has few records from the United States, known only in New England. It is described as rare in the British Isles. It apparently has never been figured for North America except by Wolle (37) and only incompletely.

Our specimens show a deeper and more decided apical notch than the form illustrated by Wests. From Wolle's figure our specimens differ in the depth of the lateral incisions and angles of divergence of the lateral lobes.

Micrasterias mahabuleshwarensis Hobson, Quart. Jour. Microsc. Sci. **1863**: 168.—Width 132.0 μ; length 148.0 μ; isthmus 19.0 μ. Pl. 330, f. 5.—Elizabeth Islands; swamp near Chatham. Conn., N. Y., Fla., Michigan (21).

This species is widely but apparently sparsely distributed along the Atlantic coast but published records seldom have included a figure. Wolle's figure is quite incomplete.

Micrasterias radiosa Ralfs. West and West, British Desmidiaceae II: 95, Pl. XLVI, f. 1, 2. 1905.

Var. ornata Nordstedt. Smith, Wisconsin Geol. Nat. Hist. Surv. Bull. **57**, (II): 47, Pl. 60, f. 3, 4. 1924.—Width 245.0 μ; length 247.0 μ; isthmus 26.0 μ. Pl. 330, f. 11.—Pond on Naushon Island.

Previously reported from Wisconsin and Iowa.

Micrasterias speciosa Wolle, Desmids of the United States, p. 119, Pl. XLV, f. 1, 2. 1884.

Forma. Width 110.5 μ; length 120.6 μ; width of polar lobe 45.2 μ; isthmus 15.0 μ. Pl. 329, f. 1.—Ponds near Hyannis, Woods Hole.

This plant, frequently met with in Cape Cod collections, shows a combination of characteristics which, to the writer, make its position difficult to determine. In many respects it is similar to Fa. of W. and G. S. West, Trans. Linn. Soc. London Ser. 2, 5: Pl. 14, f. 10, 11. In the depth of lateral and polar incisions and robustness of lobes of the semicell, as well as in the number of ultimate divisions, it is not unlike *M. conferta*. It has a marked resemblance to var. *novae-terrae* Cush.,

particularly as illustrated by Taylor (26), except that our plants have spines not shown in Taylor's figures. On account of the spines the Newfoundland plants are dissimilar to any variety of *M. conferta* known to the writer.

Wests' form of *M. speciosa* possesses spines along the margins of the apical lobe only, and the apical lobe is distinctly exserted. In our specimens this is not true of the apical lobe. Nevertheless, it seems well to consider the Cape Cod plant as an expression of *M. speciosa* rather than *M. conferta*. It appears to the writer that these two species of the genus require some study, at least in so far as they are interpreted by various authors.

Previously reported from New England by Hylander in Conn., and presumably by Wests.

Micrasterias triangularis Wolle, 1892. Width 169.0 μ; length 214.8 μ. Pl. 330, f. 6, 7.—Pond near Providence, R. I.; swamp near Hyannis. Pa., N. J., Newfoundland.

This rather rare form has not been reported for the United States since Wolle's record (1892). The apical lobe in our specimens does not agree with Wolle's figure, particularly in the amount of exsertion and I cannot be sure that the Massachusetts plant is not a variety. The plants I have seen agree with the figure and measurements as given by Taylor (26).

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Explanation of Plate 329

Fig. 1. Micrasterias speciosa Wolle. Fa. (× 492). Fig. 2. Micrasterias Jenneri Ralfs (× 295). Fig. 3. Micrasterias expansa Bailey (× 492). Figs. 4–6. Staurastrum glabrum (Ehr.) Ralfs (× 492). Fig. 7. Arthrodesmus impar (Jacobs.) Grönblad (× 492). Fig. 8. Micrasterias depauperata Nordst. (× 368). Fig. 9. Xanthidium cristatum var. uncinatum de Breb. (× 492). Fig. 10. Xanthidium cristatum var. uncinatum de Breb., side view of a semicell showing a pair of basal spines

(× 492). Fig. 11. Micrasterias decemdentata var. (?) turgidum Taylor (× 492). Fig. 12. Micrasterias decemdentata var. (?) turgidum Taylor, end view (× 368). Fig. 13. Micrasterias arcuata Bailey var. gracilis W. and G. S. West (× 492).

Explanation of Plate 330

Figs. 1, 2. Staurastrum vestitum Ralfs (× 860). Figs. 3, 4. Staurastrum concinnum W. and G. S. West, 4 (× 737); 3 (× 614). Fig. 5. Micrasterias mahabuleshwarensis Hobson (× 270). Figs. 6, 7. Micrasterias triangularis Wolle, 6 (× 270); 7 (× 127). Fig. 8. Staurastrum elongatum Barker (× 450). Figs. 9, 10. Staurastrum striolatum (Naeg.) Archer, zygospore (× 614). Fig. 11. Micrasterias radiosa var. ornata Nordst. (× 270). Figs. 12, 13. Staurastrum furcatum (Ehr.) de Breb. (× 614). Fig. 14. Staurastrum vestitum Ralfs (× 360).

OBSERVATIONS ON THE CYTOLOGY OF SEBACINA GLOBOSPORA N. SP.[1]

R. M. Whelden

Plate 331

In the course of an examination of a great many specimens of Tremellaceous fungi, the writer has found several of particular interest. One collection[2] was noticeable for several reasons, first because the young fruit bodies were found emerging from the ostioles of perithecia of a *Diaporthe* growing in small twigs of *Fraxinus sp.*, suggesting that the *Sebacina* might possibly be parasitic on the *Diaporthe;* second, because mounts in lacto-phenol-cotton blue solution showed extreme irregularity in the orientation of the septa of the basidia, raising the question of whether the nuclear phenomena here would be out of the ordinary; and finally, because it was impossible to identify the fungus as one already described. While the material obtained is a single collection and hence offers little opportunity to determine the range of variation, nevertheless the species appears within limits to be remarkably uniform and seems to justify the conclusion that it represents a new species.

The total collection, comprising some sixty separate fruit bodies, was received in a partially dried condition. A part of the material was at once placed in a moist chamber; after about six hours, part of the fruit bodies were removed and fixed, some in a chrom-acetic solution and some in a mercuric chloride-picric acid solution; eighteen hours later the rest of the material was removed from the moist cham-

[1] Contribution No. 137 from the Laboratories of Cryptogamic Botany of Harvard University.

[2] The fungus, collected at Louisville, Kentucky by Mr. Billy Lee, was sent by him to Dr. D. H. Linder, to whom my thanks are due for the pleasure of studying it.

ber and fixed in the same manner as the first, some thirty fruit bodies in all being thus fixed. This material was embedded, half of it in

Text-fig. Sebacina globospora, n. sp.

celloidin and half in paraffin, and stained in the manner which the writer has described elsewhere (1).

The young fructifications of this fungus appear as small hemispherical hyaline objects emerging from the ostioles of perithecia of *Diaporthe;* with age they spread out one square centimeter or more in a

somewhat irregular fashion over the surface of the bark, to which they are closely pressed. On drying the fruit bodies become distinctly chalky. The mycelium of young fruit bodies seems to originate in the hymenial layer of the perithecium of *Diaporthe* and to grow up through the ostiole, at the mouth of which the hyphae spread fanwise (TEXT-FIG.). All hyphae comprising this portion of the fruit body, as well as those spreading over the bark in older bodies, are of binucleated segments of great length (FIG. 1). At the tip of each segment branching frequently occurs, especially after the hyphae have emerged from the ostiole. Near the distal, somewhat enlarged part of the segment, the two nuclei, from 2 to 2.5 μ in diameter, almost invariably lie close together, surrounded by a slightly denser region of cytoplasm. Near the surface of the fruit body the hyphal segments, still binucleate, become much shorter, twisted (FIG. 2), and frequently branched, while, in the subhymenial layer the segments are very short and straight (FIG. 3). The cross-walls of these short segmented hyphae frequently show a very evident central thickness which is accentuated by its staining black with haematoxylin. Fusions between two hyphae occur infrequently, but no clamp connections were observed.

At the surface of the fruit body there are cut off binucleate hyphal tips of which the protoplasmic content is much denser. These, the hypobasidial initials, rapidly increase in size, while at the same time the dikaryons unite to form the fusion nucleus, which quickly enlarges to its maximum size of 5 to 6 μ. During this enlargement the chromatin substance becomes more and more definitely aggregated into somewhat irregular elongate masses, which, as the nucleus approaches its maximum size, contract rapidly to form eight distinct small chromosomes (FIGS. 8–10, 13). These chromosomes are short cylindrical objects which seem to show certain distinct differences in size, differences which may be somewhat exaggerated because of the orientation of the chromosomes. At this time the conspicuous nucleolus begins to disappear, as does also the nuclear membrane, leaving the chromosomes centrally located in the protoplasm of the now fully enlarged hypobasidium, with an average measurement of 17.2 x 14.2 μ. Throughout the development of the hypobasidium there has been little change in the appearance of its cytoplasm, which has become somewhat thinner and progressively more vacuolate, especially after nuclear division has occurred. Frequently there are seen scattered through it small granules which stain deeply with haematoxylin (FIGS. 7, 8).

Nuclear division immediately results in the formation of two small daughter nuclei, which may occupy any position in the hypobasidium, although usually they are midway in it (figs. 12, 33). One or both of these nuclei may immediately divide again so that one often sees hypobasidia, in which the three or four nuclei are arranged without order (figs. 19, 20).

The formation of the first longitudinal septum may occur immediately after the first division of the fusion nucleus (figs. 14, 18), or it may be delayed until a much later stage of development; the time of appearance of the second longitudinal septum is equally variable. The direction of these septa of the hypobasidia differs greatly, ranging from the usual longitudinal ones to diagonal ones at every conceivable angle, with frequent cases in which they are oriented at right angles to the long axis of the hypobasidium (figs. 21, 25). Not infrequently the first septum divides the hypobasidium transversely in two equal parts, while the second septum cuts one of these sections longitudinally in two, the other remaining without septation (fig. 26).

The development of the epibasidia likewise shows the greatest irregularity. In the species of *Sebacina* previously studied by the writer, the two to four epibasidia normally developed simultaneously from the apical portion of the hypobasidium. In the present species one often sees hypobasidia showing this characteristic development, the two, rarely more, epibasidia growing directly upward to the surface of the "jelly," expanding slightly or not at all (fig. 17). However, much more frequently the epibasidia develop very irregularly. The variation from the normal condition may be one of direction only, the two epibasidia growing out at wide angles one to the other, a condition particularly noticeable near the edge of the fruit body (fig. 5, left). Much more frequent are irregularities in time of appearance of the epibasidia; for example the epibasidium of one of the segments of the hypobasidium may develop only slightly in advance of the other, as in fig. 22, or may complete its development to spore formation while the other segment shows no indication of such, as in fig. 15; as a result of such irregularities one frequently observes hypobasidia with one half empty (fig. 27) and partially (fig. 23) or completely collapsed (fig. 34). Even more striking are the hypobasidia in which septum formation is transverse rather than longitudinal; in these either the upper (fig. 25) or the lower half (fig. 21) may have discharged its contents in spore formation, while the other half remains unchanged. Frequently the empty portion shows that it was divided independently of the other as in fig. 26.

That nuclear divisions occur independently of these changes may be seen in such cases as those shown in fig. 25, where the nucleus in the lower portion of the hypobasidium is in the early prophase of division, or more obviously in FIG. 35, where the four chromosomes are definitely present just before the disappearance of the nucleolus and nuclear membrane in metaphase. Nor does any correlation seem to exist between the nuclear condition and the epibasidia, as for example in FIG. 21, where two small epibasidial bulges appear before the single nucleus present in the segment of the hypobasidium shows any sign of division. As the development of the epibasidium progresses, the protoplasm of the hypobasidium becomes more and more vacuolate. The epibasidia themselves vary from the slender form with a uniform diameter from 1 to 1.3 μ of FIG. 33 to a very much swollen type (FIG. 15) in which the maximum diameter is 5 μ. All epibasidia contract rather abruptly at the "jelly" surface to form the slender sterigma at the tip of which the spore is formed.

The spores enlarge rapidly and when mature are subspherical to spherical bodies usually about 8 μ in diameter; rare individuals occur having dimensions of 7.8 x 7 μ to a maximum of 9 x 8 μ: all have a pronounced apiculus 1 μ or slightly more in length (FIG. 28). They often germinate immediately by a single germ tube (FIGS. 29–32), which attains a length of 6–8 μ before forming the secondary spore, similar to, but smaller than, the primary basidiospore. The same variations in form obtain in these germ tubes as occurred in the epibasidia, some being slender and slightly twisting (FIG. 10), others very coarse and straight, (FIG. 32), while still others are considerably inflated and 4 to 4.5 μ in diameter in the middle (FIGS. 31, 32). Germination of the secondary spores was not observed.

From the distal end of the hyphal segment immediately below the hypobasidium one or more branches form soon after the hypobasidium is cut off (FIGS. 7, 12). Two nuclei soon move into the developing branch after which it is cut off by a cross-wall, and becomes another hypobasidium (FIGS. 4, 16). In rare cases the lateral branch appears from the beginning to be somewhat vacuolate; in living bodies these branches are seen to contain many large drops of a refractive substance which, however, in the process of embedding and staining is dissolved out, so that they appear vacuolate (FIGS. 10, 24). These gloeocystidia, as the vacuolate structures may be classified, are always binucleate, although frequently the position of the nuclei, close together one above the other, gives the appearance of a uninucleate con-

dition. What may eventually become of these objects as growth of the fruit body continues was not observed. Other branches start as do these, but grow to a considerable length (figs. 11, 23) without noticeable change in diameter or in content: these are probably merely vegetative hyphae characteristic of rapidly growing fruit bodies.

The writer, having already discussed at considerable length the work which has been done on the Tremellaceous fungi (1), does not feel that any long discussion is necessary here. It is to be noted, however, that several workers have reported the occurrence of irregular septation in the basidia of this group, some of them finding therein points indicating the origin of the group; yet so far as the writer knows, there has been no study of the cytological condition involved. With material of this sort available, it seemed of value to ascertain whether any irregularity in nuclear behavior accompanied the more obvious irregularities of septation. The present study indicates that up to the time of septation in the hypobasidium, development is practically identical with that observed in all other members of the group which have been studied. However, both the time and direction of septum formation, as well as the subsequent development of the epibasidia show great irregularity. There at once appear three possible explanations for these irregularities: first is the fact that the fungus before study was revived in a moist chamber; however, the writer has used that method many times in studying other species of *Sebacina,* and only rarely found any irregular forms. Again it may be suggested that the growth of the fruit bodies apparently parasitic on an Ascomycete is significant; while this might account for the variations from normal, there seems to be no real reason why it should. Finally it would seem to the writer more probable that the cause for the irregularities is inherent in the fungus itself. Certainly all the fruit bodies studied in this collection agree in showing the variations, indicating that it is apparently characteristic of the species. Because of this and of the more important fact that the dimensions of its parts, notably the hypobasidia and spores, are considerably larger than those of the species it most closely resembles, *Sebacina* (*Bourdotia*) *cinerella* Bourd. et Galz., the writer feels justified in proposing it as a new species of *Sebacina:*

Sebacina **globospora,** sp. nov., fruit bodies at first hemispherical and colorless, becoming watery-gray effuse bodies from 6 to 12 mm. in extent, on drying becoming chalky, pressed against but not adnate to the substratum. Hyphae 2 to 3 μ in diameter, without clamp connections. Basidia ovate, 15–17–20 x 12–14–16 μ; average: 17.2 x 14.2 μ.

Epibasidia variable, up to 14 μ in length, 2–3–(5) μ in diameter. Spores spherical to subspherical, 7.8 to 8 μ in diameter, each with a pronounced apiculus. Gloeocystidia rare, 28–35 x 7 μ when mature. Young fruit bodies growing from the ostioles of the perithecia of *Diaporthe*, older ones spreading out over the surface of bark of twigs of *Fraxinus;* collected near Louisville, Kentucky, in September, 1934. (Type in Farlow Herbarium, Harvard University.)

Sebacina **globospora** sp. nov. Fructificationes primo subglobosae decoloresque, tardius cinereae, hyalinae, effusae, 6–12 mm. extensis, exsiccatae cretaceae, depressae sed non substrato adnatae. Hyphae 2–3 μ diam., anodosae. Basidia ovata, 15–17–20 x 12–14–16 μ (plusminusve 17.2 x 14.2 μ). Epibasidia inconstantia, ad 14 μ longa, 2–3–(5) μ diam. Sporae globosae vel subglobosae, hyalinae, leves, 7.8–8 μ diam., evidenter apiculatae. Gloeocystidia rara, clavata, 28–35 x 7 μ.

Summary

Sebacina globospora, sp. nov., growing from the ostioles of and apparently parasitizing the perithecia of *Diaporthe*, is of particular interest because of the irregularities in the formation of the septa of the hypobasidia, and the time of development of epibasidia. The septa are formed in almost every conceivable position in the hypobasidium. Variation in epibasidial development ranges from the simultaneous formation of the two to four epibasidia to those cases in which one epibasidium has borne a mature spore before the others have appeared at all. The tendency towards suppression of branching as shown in Figs. 5 and 16 immediately calls to mind the condition existing in *Sirobasidium*, in which genus the branching habit has been totally suppressed, to be replaced by a basipetal formation of basidia.

Explanation of Plate 331

All figures drawn with the aid of a Camera lucida at a magnification of about 3700 ×, and reduced in reproduction to about 0.3 ×. An absolute scale is included in the plate.

Figure 1. Elongate mycelial segment in older portions of fruit body. 2. Mycelial segment near surface of fruit body. 3. In sub-hymenial region. 4. Binucleate hypobasidial initial (right) and young hypobasidium (left). 5. Widely diverging epibasidia from a hypobasidium near margin of fruit body, also showing suppression of branching. 6. Hypobasidium with fusion nucleus showing linear masses of chromatin. 7. Basidia developed from single branch tip near center of fruit body. 8. Contraction of chromatin masses. 9 & 10. Eight chromosomes and nucleolus within the nuclear membrane; lateral branch in figure 10 showing early appearance of gloeocystidium. 11 & 12. Hypobasidium containing four and two small nuclei respectively. 13. Hypobasidium containing eight chromosomes and nucleolus in late prophase of fusion nucleus. 14. First longitudinal septum forming after first division of nucleus. 15. A basidium with one epibasidium completely developed, the other not as yet in evidence. 16. Two well-developed hypobasidia at tip of hypha. 17. Normal development of two epibasidia from hypobasidium. 18. Formation of first longitudinal septum diagonally. 19. Early appearance of epibasidia

before septa are formed. 20. Four-nucleate epibasidia. 21 to 23; 25 to 27, 33 to 35. Abnormal septations of hypobasidia. In figure 33 no septa have been formed, while in figure 35 nucleus of lower cell is in prophase condition. 24. Immature gloeocystidium with much vacuolate protoplasmic content. 28. Uninucleate spores. 29 to 32. Germinating spores, showing variations of germ tube.

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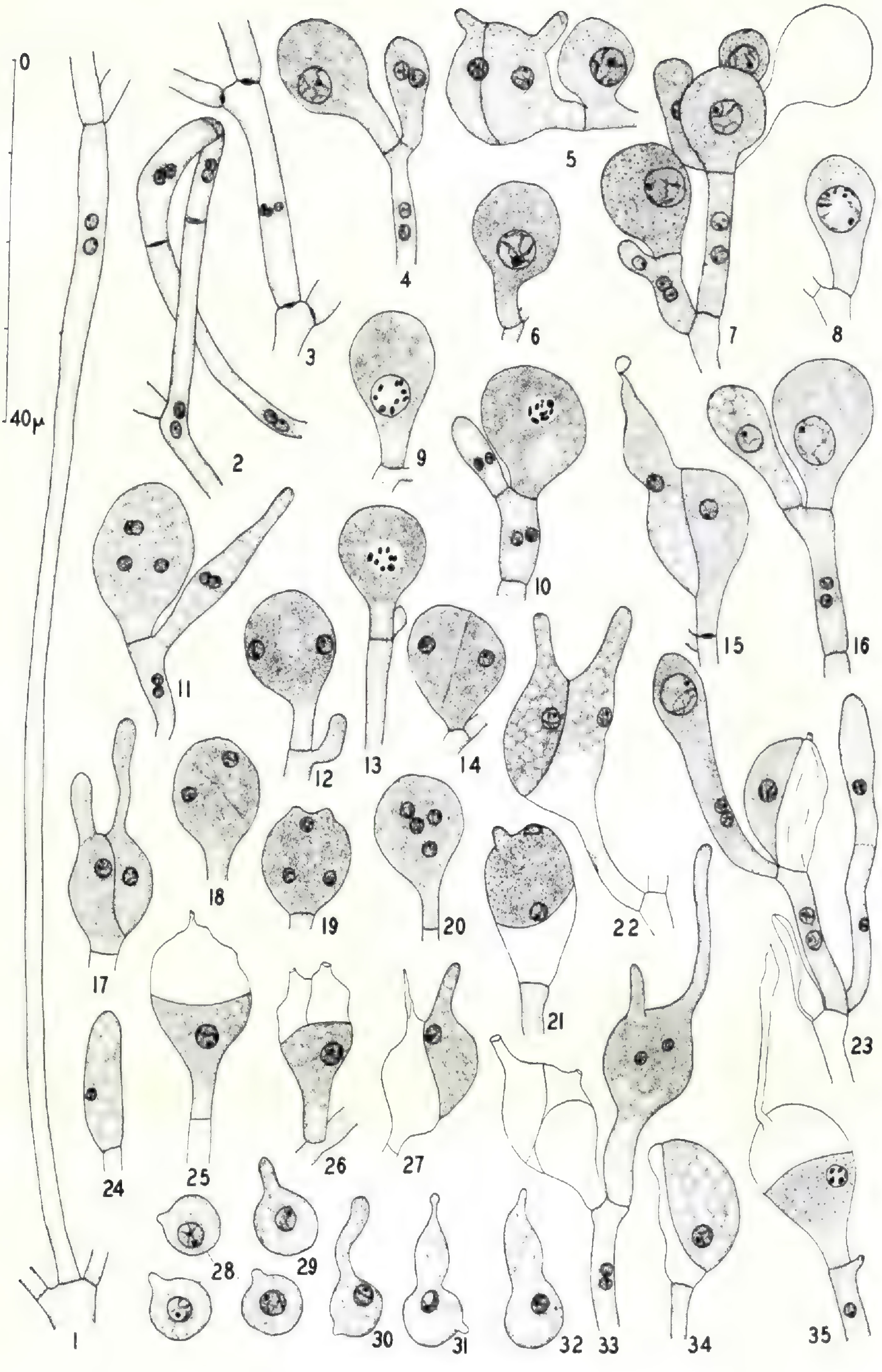
A New Carex Hybrid.—Sometime during the winter of 1932–33, I received an exchange packet of plants from Professor Alfred S. Goodale of Amherst College. One of these was no. 68660, labelled *Carex pallescens*, from Woodstock, Grafton County, New Hamphsire, collected June 21, 1932. It did not look "right" to me, so I laid it aside for further study at the Gray Herabrium, after concluding it was a hybrid. Upon showing it to Professor Fernald, he suggested that it might be *C. hirtifolia* × *pallescens*. Critical study would seem to show that this "educated guess" was entirely correct. The leaves are as long, as broad, and as softly pubescent as in luxuriant *C. hirtifolia*. In technical characters the perigynia are exactly as in *C. pallescens*, but the scales tend to be more truncate, as in *C. hirtifolia*. The pistillate spike as a whole is, however, a combination of the two species, as it is larger and more long-cylindric than in *C. pallescens*. The staminate spike is well developed and 2 cm. long, much as in *C. hirtifolia*. At the same time Professor Goodale sent another sheet to the New England Botanical Club. Both presumed parent species occur in the Woodstock region. The hybrid origin of the collection seems to be the best interpretation of the facts at the moment. Certainly no sheet of *C. pallescens* in the enormous series in the Gray and the New England Club herbaria shows any such extreme of variation. —Ludlow Griscom, Harvard University.

Volume 37, no. 434, including pages 33–76 and plate 326, was issued 8 January, 1935.



SEBACINA GLOBOSPORA, n. sp.

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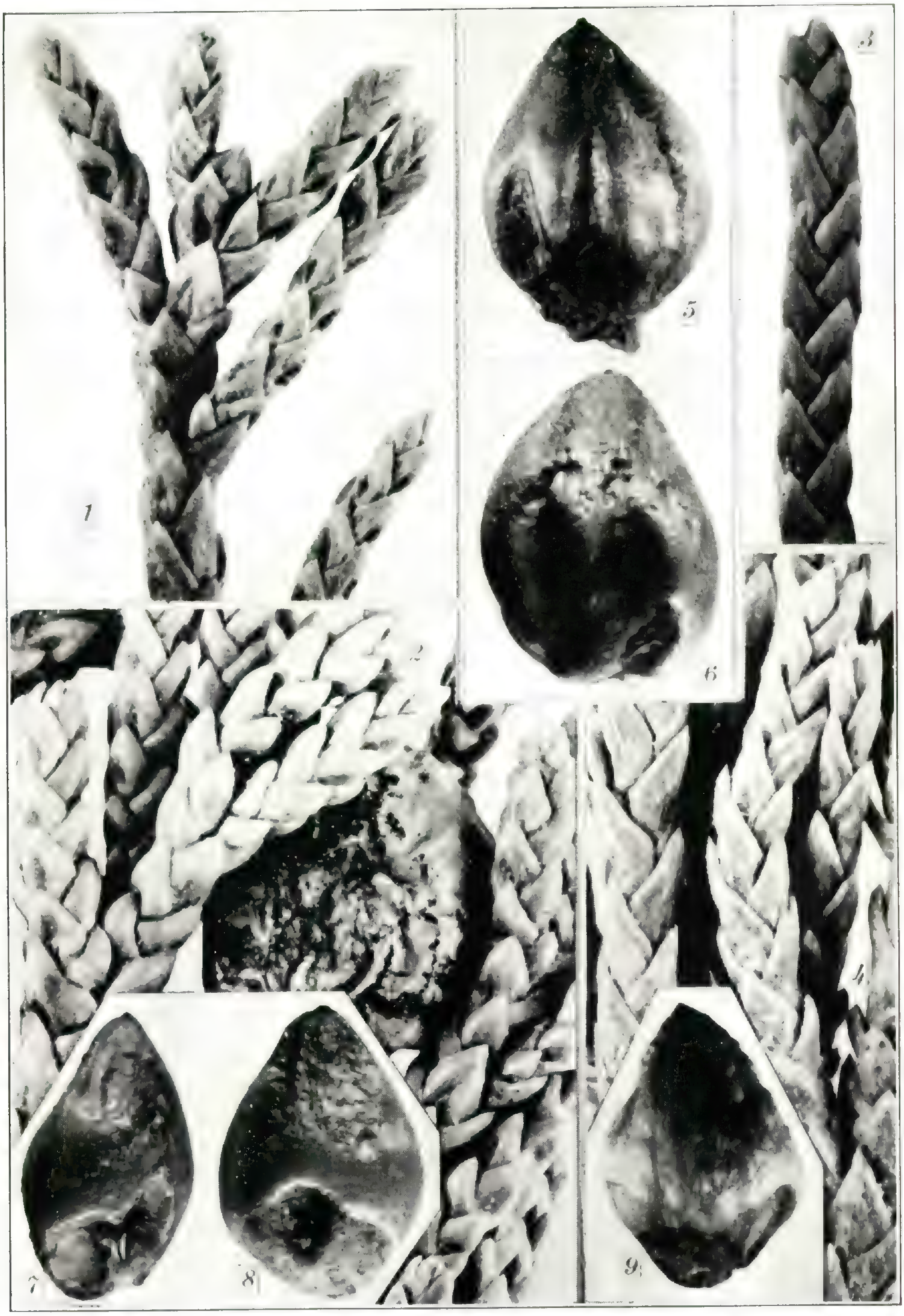

Photo. *E. C. Ogden.*

JUNIPERUS VIRGINIANA; foliage, × 10; seeds, × 10: FIG. 1, from Missouri; FIG. 2, from Virginia; FIG. 3, from North Carolina; FIG. 4, from Tennessee; FIG. 5, from Missouri; FIG. 6, from North Carolina; FIGS. 7 and 8, from Virginia; FIG. 9, from Tennessee.

Rhodora

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THREE DAYS OF BOTANIZING IN SOUTHEASTERN VIRGINIA

M. L. Fernald and Ludlow Griscom

(Plates 232–251)

In recent ornithological and botanical trips to the southeastern United States the junior author had been impressed with the distinctively austral elements which extend northward on the outer coastal plain and an earlier experience on a spring trip to the region of Back Bay in Princess Anne County, Virginia, had vividly indicated the need for fuller collections, especially in technical groups, from that southeast corner of the "Manual range." The first extensive collections from Virginia were those of the younger John Clayton, who botanized largely, for the time, in Gloucester County and doubtless elsewhere in eastern Virginia and secured plants from as far west as the Shenandoah Valley. Upon Clayton's collections Gronovius based his *Flora Virginica Exhibens Plantas Quas V. C. Johannes Clayton In Virginia Observavit atque collegit* (1739). Gronovius, with the aid of Linnaeus (then a young student) gave very detailed descriptions (but without binomials) of the Clayton plants, and in 1753 Linnaeus, in *Species Plantarum,* rested many scores of binomials wholly or primarily upon the Gronovian descriptions and the Clayton specimens, which he had formerly studied. Southeastern Virginia is, therefore, the TYPE-REGION of a large number of Linnean species; and very detailed collecting is needed there in order clearly to interpret what Gronovius and Linnaeus actually had before them. To a

great extent, of course, the identities can be determined through study of the actual specimens of Clayton, now scrupulously preserved at the British Museum of Natural History. Asa Gray and numerous other American botanists have made notes based upon study of these Clayton plants, and each of the present authors has studied special types. Unfortunately, however, no one without intensive knowledge of the flora of eastern North American, and particularly of eastern Virginia, can properly interpret them; for in many groups the plants of southeastern Virginia prove, upon field acquaintance, to be quite different from the more northern or inland species or varieties which have been identified with them.

With the double hope of securing fresh material of critical plants from not too far away from Clayton's collecting-grounds and of extending northward into southeastern Virginia species already known from the coastal plain of North or South Carolina, we left Cambridge, after a very early breakfast, on the morning of September 20, 1933, for the region of Cape Henry. With only five days before we must be back in Cambridge, no slack time was allowable; we reached Morristown, New Jersey, for lunch and drove aboard the Norfolk ferry at Cape Charles in the evening, 585 miles from Cambridge. Establishing ourselves at Virginia Beach we began, at noon on the 21st, three days of unremitting collecting: two sheets each of every species not already quite familiar or of members of technical groups in which special study seemed needed. Working far into the night and cutting sleep to a minimum we secured and brought back to Cambridge the series of specimens which forms the basis of this report. It very soon became evident that many species had been quite misinterpreted or hastily and inconclusively dealt with in the past; consequently our necessarily limited series, collected at the close of September, has occupied the late afternoons of many days during two academic years. And, even now, many highly technical groups can not be dealt with. They await further comparisons with the Clayton and other types of Linnaeus or with those of Walter, Lamarck, Poiret and Michaux and will be considered in a later paper.

One feature of the outer coastal plain of Princess Anne County, for which we were not prepared, was the relative abundance there of Alleghenian types, growing in close proximity to the typical coastal plain species. *Oxydendron arboreum* is common; typical *Juniperus virginiana* of the limestone bluffs of Tennessee and Missouri abounds; and our collections include *Laportea canadensis* and some other up-

land species. The work of the late E. J. Grimes showed a similar intrusion into the outer coastal plain of plants typical of the interior. In Princess Anne County the presence of large areas of neutral to calcareous clays side-by-side with acid sands and peats seems to be the factor which favors this blending of floras. Further study of the region in the summer of 1934 by Fernald and Long greatly increased the number of Alleghenian species known in this outermost county of southeastern Virginia.

In the summer of 1934 the junior author studied many types in London and Paris, and from the discussions following it will be seen how frequently these have been misinterpreted. The case of *Lippia lanceolata* is typical. Michaux described the species from the outer coastal plain of South Carolina. No material of this plant was known to Asa Gray but a similar plant of the interior, having broader leaves, has regularly passed as *L. lanceolata*, Gray specially noting, in the Synoptical Flora, the plant of the interior with leaves "varying from obovate and lanceolate-spatulate to ovate" and Michaux's "name therefore inapt." We now have characteristic material from southeastern Virginia and southeastward on the coastal plain which shows that Michaux's name was "apt!"

Very recently the activity of the botanists of Virginia has found an outlet in the new journal, Claytonia; this evidence of renewed interest in the flora of the state is most welcome and much clarification of identities as well as knowledge of local distribution is looked for. The results, so far as yet worked out, of study of our own fruits of three days of collecting are here given. In some cases, it will be noted, our collections of September, 1933, are supplemented by the specimens secured in late July and early August, 1934, by Fernald and Long. The fuller report on this later collection is now being prepared by the senior author. In the illustration of the present paper we have had the unexcelled help of Professor J. Franklin Collins, who has freely given his services in preparing several of the plates, while others have been prepared by Mr. E. C. Ogden. The expenses involved in their preparation and in the making of the half-tone blocks have been met by a grant to the senior author from the Milton Fund for Research of Harvard University; and the large cost of reproducing the blocks has been most generously defrayed by Mr. Bayard Long. Our keen appreciation of and thanks to those who have thus aided us is here publicly expressed.

Juniperus virginiana and its northern Variety (Plates 332

and 333).—In the course of field-work in the South we and others before us (notably Mr. Francis Hunnewell and Dr. H. K. Svenson) have been greatly impressed with the very different aspect of much of the Red Cedar of the South as compared with that of the North. Many of the southern trees lack the stiff, narrowly pyramidal or spire-like outline so characteristic of the northern tree, the outline of the crown being more ovoid, with the lower branches widely spreading or more pendulous, regardless of whether the trees are fruiting or sterile. A thorough study of specimens shows that these habital differences are usually accompanied by certain technical characters. In much of the southern material, from southeastern Virginia to Missouri and southward, chiefly in argillaceous or calcareous areas, the leaves of the adult branchlets (PL. 332, FIGS. 1–3) are tightly appressed, rather broadly deltoid and obtuse or merely subacute, while the base of the seed has deep and conspicuous pits (PLATE 332, FIGS. 5–8). In the northern tree, of more sterile to acid soils, the leaves of the adult branchlets are narrower and attenuate to sharp and with usually less appressed tips (PL. 333, FIGS. 1–4), and the seeds (PL. 333, FIGS. 5–8) have only shallow basal pits. A large series of specimens from the coastal plain, from New Jersey to southeastern Massachusetts, is somewhat intermediate; while the characteristic northern extreme extends southward, chiefly in the mountains, to North Carolina and locally to Missouri.

In seeking the proper names for these two very real geographic varieties it is necessary first to identify typical *Juniperus virginiana* L. Linnaeus, Sp. Pl. 1039 (1753) quoted his earlier diagnosis from *Hortus Cliffortianus*, with references to Gronovius, Royen, Ray and Sloane. The latter, referring to a West Indian tree, can be dismissed as having nothing to do with the species of "Virginia, Carolina." The brief diagnoses in *Hortus Cliffortianus* and in Gronovius are not sufficiently definite to show which variety was in hand. The junior author, however, made close examinations of the specimens concerned while in London in the summer of 1934. The *Hortus Cliffortianus* specimen (no. 464) is the end of a young shoot, showing only the juvenile foliage and none of the appressed scales necessary for identification. The Clayton specimen (no. 884) which was the basis of the primary diagnosis of Gronovius is clearly the southern variety. In the Linnean Herbarium there is also a specimen of *J. virginiana*, and this is probably the northern extreme, although the mature scales are just forming and, consequently, are not wholly characteristic. In

view of the fact that in the Species Plantarum Linnaeus gave no new diagnosis, his species should be typified by the first cited specimen which is identifiable. This is the Clayton specimen described by Gronovious. Typical *J. virginiana* is, accordingly, the broader- and blunter-leaved southern tree.

Many varietal, subspecific and specific names have been proposed within the group but they are all vague or confused in their application, except for numerous minor horticultural forms. *J. caroliniana* Mill. (1768),[1] *J. arborescens* Moench (1794) and *J. fragrans* Salisb. (1796) were mere renamings of *J. virginiana* L. *J. virginiana*, β, *J. caroliniana* Willd. (1796) was based on *J. caroliniana* Mill. *J. virginiana* **Hermanni* Pers. (1807), as defined, seems to have had the adult and juvenile foliage confused. *J. virginiana*, A. *vulgaris* Endl. (1822) was simply *J. virginiana* in the aggregate, as contrasted with his B. *australis*, which is *J. barbadensis* L. *J. virginiana*, var. *montana* Vasey (1876) was from Utah and Colorado, published without any stated technical characters; at least it is not the northeastern tree. It seems, therefore, that the two varieties, as such, have not been clearly differentiated; and that the northern more widely ranging extreme should be called

JUNIPERUS VIRGINIANA L., var. **crebra** var. nov. (TAB. 333), foliis maturis anguste ovatis acutis, apice vix arcte adpressis; seminibus basin versus leviter foveolatis.—TYPE: dry open gravelly soil, Barnstable, MASSACHUSETTS, July 24, 1919, *Fernald & Long*, no. 17,797 in Gray Herb.

Whereas the foliage of adult branchlets is usually distinctive, it is sometimes transitional; but the most fundamental difference is in the pitting of the seeds. Thus, specimens from "large trees with pendulous branches" collected near Waynesboro, Wayne Co., Tennessee (*Svenson*, no. 4308) are of such transitional material, with habit of typical *J. virginiana*, leaves (PL. 332, FIG. 4) of var. *crebra*, but seeds (FIG. 9) very definitely of the southern type. In separating the seeds from the flesh we have gently chewed hundreds of fruits. It is significant that fully ripe fruit of the southern typical *Juniperus virginiana* has a strong pitchy flavor without any ameliorating sweetness, whereas the ripe fruit of var. *crebra* usually has sweet flesh.

TRIODIA FLAVA (L.) Hitchc., var. **Chapmani** (Small), comb. nov. *Sieglingia Chapmani* Small, Bull. Torr. Bot. Cl. xxii. 365 (1895). *Triodia Chapmani* (Small) Bush, Trans. Acad. Sci. St. Louis, xii. 74 (1902). *Tridens seslerioides*, var. *Chapmani* (Small) Nash, Fl. Se.

[1] The detailed references are all given by Sargent in the Sylva.

U. S. 142 (1903).—Range extended north to southeastern Virginia: dry oak woods, "The Desert," Cape Henry, no. 2758.

T. flava, var. **aristata** (Scribn. & Ball), comb. nov. *Triodia seslerioides*, var. *aristata* Scribn. & Ball, U. S. Div. Agrost. Bull. xxiv. 45 (1900).

Var. *Chapmani* is distinguished from typical *Triodia flava* by its usually more pedicelled spikelets, which are commonly fewer-flowered, by its smoother and more attenuate lemmas, by the longer and more lanate tufts at the bases of the branches, and by the very slender basal sheaths. The branches are more inclined to be widely divergent. In our material all these characters are developed to an extreme degree, so much so that in the field we failed to recognize the true affinity of the plant.

Var. *aristata*, well characterized in the original diagnosis, seems to be a highly localized extreme in Florida.

In the extreme West and Southwest of the range of the species there are several minor tendencies but not sufficiently constant to merit taxonomic recognition. One of these was the basis for *Triodia cuprea*, var. *intermedia* Vasey, Contr. U. S. Nat. Herb. i. 201 (1892), published merely as a *nomen nudum* for C. S. Sheldon's no. 273 from near Fort Sill, Oklahoma (Indian Territory). This variety was afterwards validated by its publication with diagnosis as *Sieglingia seslerioides*, var. *intermedia* Vasey ex Dewey, Contr. U. S. Nat. Herb. ii. 539 (1894). Professor Hitchcock, who has kindly loaned us a sheet of Sheldon's collection in the United States National Herbarium, as well as the type of var. *aristata*, writes that the sheet no. 273 was not retained at Washington, and that, consequently, another (but unnumbered) sheet of Sheldon's material has there been taken to be the type. Fortunately, however, sheet no. 273, which was long ago sent in exchange from the National Herbarium to the Gray Herbarium, contains two culms, one of which has been returned to Washington. This material, although younger, seems to us to differ in no fundamental character from the other Sheldon plant which had been retained at Washington. Var. *intermedia*, as already intimated, seems hardly separable from typical *T. flava.*

Tricuspis seslerioides, var. *pallida* Holm, Proc. Biol. Soc. Wash. xiv. 19 (1901) is only a minor form with greenish spikelets.

Eragrostis hirsuta (Michx.) Nees. Admitted in the 2d edition of Britton & Brown (1913) on the basis of a report by Kearney. The species seems to be common in southeastern Virginia.

Spartina patens (Ait.) Muhl., var. juncea (Michx.) Hitchc.

Pools in sandy pine barrens, Cape Henry, Virginia, *Fernald & Griscom*, no. 2711.

The extraordinary habitat, strictly fresh pools, where it was associated with *Xyris* and other typical pine barren species, led us to hope that we had a unique *Spartina*. We are unable to find any character, however, to separate it from the ordinary plant of the coast.

Cinna arundinacea L., var. **inexpansa**, var. nov. (tab. 334, figs. 1 et 2), a forma typica differt paniculis contractis ramis valde adscendentibus; spiculis brevioribus 3.7–4.2 mm. longis; glumis lineari-lanceolatis, inferiore hyalina glabra carina scabra evanescenti excepta, superiore lemmati aequante vel quam eo breviore.—Type: damp woods, Virginia Beach, Virginia, August 8, 1934, *Fernald & Long*, no. 3648. Collected by us in edge of gum swamp, North Landing, Norfolk Co., no. 2732; damp pine barren, Macon's Corner, Princess Anne Co., no. 2733. Specimens, without definite locality given, from Louisiana, *Hall*, and from Oklahoma, 1891, *C. S. Sheldon*, no. 291, seen to be identical with ours.

Typical *Cinna arundinacea* of more northern or inland range, the type from Canada (presumably near Montreal), has the larger panicle in maturity with spreading to flexuous branches; the spikelets (fig. 3) 4.5–6 mm. long; 1st glume subherbaceous, hyaline only along the margin, strongly scabrous-hispid on the back, the 2d glume usually nearly equaling to exceeding the lemma. The typical plant follows south in the piedmont and upland regions to Georgia. Var. *inexpansa* is apparently confined to the Coastal Plain of the Gulf and Southeastern States. In southeastern Virginia it seemed to be frequent, but all the specimens seen in 1933 had the foliage badly damaged, probably by the violent storms of the summer.

Var. *inexpansa*, the most austral representative of the genus in the eastern United States, combines in a remarkable manner the technical characters of *Cinna arundinacea* and the boreal *C. latifolia* (Trev.) Griseb. The latter species, of circumboreal range, occurs generally from southern Labrador to southern Alaska, thence south into the wooded northern states and along the mountains of North Carolina (4000–6000 ft.), Tennessee (6500 ft.), Colorado and California. Yet, in its short spikelets with hyaline 1st glume *C. arundinacea*, var. *inexpansa* of the southern Coastal Plain is very close to *C. latifolia* (fig. 4). It has, however, the habit, unequal glumes, firm 2d glume and long anthers (1.2–1.5 mm. long, those of *C. latifolia* 0.5–0.8 mm.) of *C. arundinacea;* and numerous specimens from Oklahoma and Arkansas clearly connect it with the latter species.

Aristida lanosa Muhl., var. **macera**, var. nov. (tab. 335), a forma

typica recedit culmis solitariis vel subsolitariis filiformibus 4.5–7 dm. high; foliis vix 2 mm. latis inflorescentia aequantibus vel superantibus, vaginorum tomento sparsiore; panicula 1–2.2 dm. longa ramis simplicibus quam plurimum 2 cm. longis; glumis subaequantibus 8–16.2 mm. longis; arista media 2.5–3.5 cm. longa; antheris 3–3.5 mm. longis.—Virginia: dry oak woods, Cape Henry, September 23, 1933, *Fernald & Griscom*, no. 2719 (type in Gray Herb.; isotype in herb. Griscom).

Typical *Aristida lanosa* is ordinarily 0.8–1.5 m. high, with stoutish culms often in tufts; the leaves much shorter than the culms, 3–6 mm. wide, with sheaths densely lanate; panicle decompound, 3–7 dm. long, with elongate branches; 1st glume 12–21 mm. long, notably exceeding the 2nd; middle awn 1.5–3 cm. long; anthers 5.5–6 mm. long. Var. *macera* was so very distinct in the field that its relationship to *A. lanosa* was not suspected, in spite of our having seen the latter in abundance the preceding day. Typical *A. lanosa*, in characteristic development, also occurs at Cape Henry, in sandy pine woods (our no. 2716),

Aristida purpurascens Poir., var. minor Vasey. In his recent *Critical Revision of the Genus Aristida* Henrard defines var. *minor* more sharply than was originally done by Vasey by giving measurements of the specimen accepted by Hitchcock as the type: 1st glume 9 mm. long, 2d glume 8 mm., lemma 6 mm., central awn 22 mm. Examination of 15 sheets from the extreme Southwest and the Gulf States shows this thinner-panicled and less cespitose extreme there to be the prevailing form. As a matter of fact, the maximum measurement for the 1st glume proves to be 9 mm. and the minimum 6.5 mm., with the majority 8 mm. or less. The variety ranges from Texas to Florida, thence northward near the coast to southeastern Virginia. Our collection, apparently the first from north of South Carolina, is from dry thickets, Cedarville, Norfolk Co., September 22, 1933, no. 2717. In the field the plant was not recognized as *A. purpurascens*, because of its small tufts and thin panicle.

Panicum longifolium Torr., var. Combsii (Scribn. & Ball) Fern. Rhodora, xxxvi. 69 (1934). Wet pine barrens, Macon's Corner, Princess Anne Co., no. 2737.

Not recorded by Hitchcock and Chase from north of Georgia.

Echinochloa pungens (Poir.) Rydb., var. **coarctata**, var. nov. (tab. 336, figs. 1 et 2), paniculis densifloris ramis coarctatis; spiculis 3.5–4.5 mm. longis valde aristatis; lemmatibus glabris vel dorso tantummodo puberulis sparse ciliatis spiculis bullatis.—Virginia: brackish marsh of North Landing River, Pungo Ferry, Princess Anne

Photo *E. C. Ogden.*

JUNIPERUS VIRGINIANA, var. CREBRA; foliage, × 10; seeds, × 10: FIG. 1, from Pennsylvania; FIG. 2, from Massachusetts (*type*); FIG. 3, from Connecticut; FIG. 4, from New York; FIG. 5, from Pennsylvania; FIG. 6, from Connecticut; FIG. 7, from New York; FIG. 8, from Massachusetts (TYPE).

Photo. *J. F. Collins.*

Cinna arundinacea: fig. 3, spikelets, × 12. C. arundinacea, var. inexpansa: fig. 1, panicle, × 1; fig. 2, spikelets, × 12. C. latifolia: fig. 4, spikelets, × 12.

Co., September 22, 1933, *Fernald & Griscom*, no. 2760 (TYPE in Gray Herb.; isotype in herb. Griscom).

When the combination *Echinochloa muricata* (Michx.) Fern., based on *Panicum muricatum* Michx. (1803), was proposed in RHODORA, xvii. 106 (1915) it was valid under the then existing International Rules. With the recent adoption of the homonym rule, however, it now becomes invalid because of the earlier *Panicum muricatum* Retz. (1786). The first available name for the species is *E. pungens* (Poir.) Rydb. Brittonia, i. 81 (1931), based on *Panicum pungens* Poir. in Lam. Encycl. Suppl. iv. 273 (1816), which was itself a substitute for the invalid *P. muricatum* Michx.

The varieties of *Echinochloa muricata* defined by Wiegand become

E. PUNGENS, var. **ludoviciana** (Wieg.), comb. nov. *E. muricata*, var. *ludoviciana* Wieg. RHODORA, xxiii. 58 (1921). FIG. 3.

Var. **occidentalis** (Wieg.), comb. nov. *E. muricata*, var. *occidentalis* Wiegand, l. c. 58 (1921). *E. occidentalis* (Wieg.) Rydb. l. c. 82 (1931).

Var. **microstachya** (Wieg.) comb. nov. *E. muricata*, var. *microstachya* Wiegand, l. c. 58 (1921). *E. microstachya* (Wieg.) Rydb. l. c. 82 (1931).

Var. **multiflora** (Wieg.) comb. nov. *E. muricata*, var. *multiflora* Wieg. l. c. 59 (1921).

Var. *coarctata*, described above, has the panicle with appressed-ascending and crowded branches as in var. *ludoviciana* but with awns as in typical *E. pungens*. It differs from the other described varieties in having the sterile lemma glabrous or merely puberulent on the back, with the bullate-based spicules few and marginal or very rarely on the keel.

ECHINOCHLOA WALTERI (Pursh) Nash, forma **breviseta**, forma nov., aristis brevibus 3.5–4.5 mm. longis.—VIRGINIA: by Northwest Branch of North Landing River, North Landing, Norfolk Co., September 22, 1933, *Fernald & Griscom*, no. 2761 (TYPE in Gray Herb., isotype in herb. Griscom).

With the characteristic spikelets and hispid sheaths of *E. Walteri*, but with extraordinarily short awns, typical and common *E. Walteri* having the awns usually 1–2 cm. long.

ANDROPOGON TERNARIUS Michx. var. **glaucescens** (Scribn.), comb. nov. *A. Elliottii glaucescens* Scribn. Bull. Torr. Bot. Cl. xxiii. 145 (1896). *A. Scribnerianus* Nash, Bull. N. Y. Bot. Gard. i. 432 (1900). Our plant from VIRGINIA: pine barrens and open sandy barrens, Cape Henry, nos. 2762, 2763.

Var. *glaucescens* is a well marked extreme but without good morphological characters to separate it from *A. ternarius*. In several

cases specimens are definitely transitional. Our plants, representing the extreme variation, are, apparently, the first reported from north of Georgia, though material from North Carolina (Bat. Cave, Henderson Co., *Biltmore Herb.* no. 895[c]) is equally characteristic.

We are unable, also, to keep apart as a species *A. Cabanisii* Hack. Numerous specimens are transitional from true *A. Cabanisii* to *A. ternarius* and its var. *glaucescens*. Extreme specimens are easily recognizable by the great reduction in length and abundance of the terminal internodal hairs of the rachis and by the more or less veiny backs of the sterile lemmas. As a variety this plant becomes

A. ternarius, var. **Cabanisii** (Hack.), comb. nov. *A. Cabanisii* Hack. Flora, lxviii. 133 (1885).

Although Hackel cited *A. Cabanisii* from Pennsylvania, and, after him, Nash stated the range as "Pennsylvania (according to Hackel) and Florida," we have seen no material from north of North Carolina (Raleigh, *Ruth*, no. 578). Florida specimens distributed by A. P. Garber in 1877 bear a printed label with the address, "Columbia, Penna." It is surmised that the "Pennsylvania" record was based on such a specimen.

The specific lines between *A. ternarius* and *A. Elliottii* Chapm. have not always been clearly stated, as the separation of the two species on the alleged greater development of the spathe in *A. Elliottii* proves completely to break down in *A. Elliottii*, var. *gracilior* Hack. Although *A. ternarius* can usually be recognized by its very long peduncles, while the racemes of *A. Elliottii* are largely or completely included within the fascicle of large spathes, this character also breaks, for an extreme of the latter, chiefly from inland stations, has many long-exserted peduncles. The most stable characters, as given by Nash, are as follows: in *A. Elliottii* the sessile spikelet 3.5–5 mm. long, narrowly linear-lanceolate, equaling or somewhat exceeding the internodes; pedicel of sterile spikelet usually much longer than the sessile spikelet. In *A. ternarius* the sessile spikelet is more broadly lanceolate, 5–6 mm. long, about twice as long as the internode and equaling or clearly exceeding the pedicel of the sterile spikelet. Inspection of material shows that these are really fundamental characters.

A. Elliottii, as originally defined by Chapman and as shown by a sheet which he sent to Asa Gray, is the common coastwise plant of the Southeast, with enlarged spathes and included or mostly included racemes. In the northern part of its range inland, locally in Delaware,

Maryland, District of Columbia, western North Carolina and in southern Indiana, a well marked extreme occurs, in which most of the racemes are elevated on long peduncles, in this character suggesting *A. ternarius*. In this extreme the inflorescence is elongate, with well developed secondary lower branches. This plant, with notable geographic segregation, may be called

A. Elliottii Chapm., var. **projectus**, var. nov., formae typicae simillima a qua differt inflorescentiis elongatis (2–4 dm. longis) fasciculis remotis, racemis superioribus valde exsertis longe pedunculatis.—Type from North Carolina: open woods and abandoned fields, Biltmore, Buncomb Co., September 26, 1898, *Biltmore Herb.* no. 1421[c]. Other specimens are the following. Delaware: Wilmington, 1861, *Canby*. Maryland: sandy soil near Riverdale, October 3, 1911, *Holm*, as *A. argenteus*. District of Columbia: old sterile field, Chevy Chase, September 24, 1922, *Agnes Chase;* without locality, September 22, 1896, *Steele*. Indiana: Forest Reserve, Clark Co., *Deam*, no. 26,865.

A Review of Andropogon virginicus and A. glomeratus (Plates 337 and 338). In the northern half of the Atlantic coastal states botanists have long been familiar with two strikingly different plants, currently known as *Andropogon virginicus* L. (pl. 337, fig. 1) and *A. glomeratus* (Walt.) BSP. (pl. 338, fig. 3). The former, with slender culms and simple or subsimple, elongate inflorescences, is characteristic of dry habitats; the latter, with coarser culms and densely glomerate and subcorymbose or subturbinate inflorescences, of wet peats or marshes. From southeastern Virginia southward these two extremes, though very distinct in the North, are connected by a series of well marked variations, some of which have even been treated as species, but which in their spikelets show no definable differential characters.

The slender plant with simple or subsimple inflorescences (pl. 337, fig 1), which has generally passed as *A. virginicus*, is treated, correctly (as shown by an examination of the type by the junior author and by a photograph of it sent to the Gray Herbarium), by both Hackel and Nash as true *A. virginicus:* var. *α*, *viridis*, subvar. 1. *genuinus* Hackel. Although Hackel distinguished various green and more or less glaucous plants as varieties and subvarieties, these characters, when not accompanied by other differences, seem of slight taxonomic importance. Typical *A. virginicus*, whether green or glaucous, passes insensibly into a commoner southern tendency (pl. 337, fig. 3) with generally coarser habit and branching or paniculate inflorescences but without any apparent differences of spathes or

spikelets. This is *A. tetrastachyus* Ell. Sk. i. 150 (1816) or *A. virginicus*, var. *tetrastachyus* (Ell.) Hack. in DC. Monogr. Phan. vi. 411 (1889). Although Nash does not recognize var. *tetrastachyus* as distinct from *A. virginicus*, it is very strikingly different in the field to northern-trained eyes and its concentration in the South but absence from the North marks it as a well defined geographic variety. Hackel conceived var. *tetrastachyus* as a plant with villous foliage, but this vegetative character is too fickle to be made the primary basis of varietal differentiation. Otherwise there seems to be no appreciable difference between var. *tetrastachyus*, as conceived by him, and his var. *viridis*, subvar. *ditior*, "paniculae valde ramosae rami primarii 2–3^{ni}, 3–5-nodes, secundarii 3–5^{ni}, 1–3-nodes, saepe tertianos procreantes," a plant of which Hackel pertinently remarked: "Transitum indigitat in A. macrourum, a quo tamen differt panicula laxa, laminis foliorum superiorum brevissimis nec paniculam aequantibus."

This variety, *A. virginicus*, var. *tetrastachyus* (including Hackel's var. *viridis*, subvar. *ditior*), strongly simulates another southeastern series of plants (pl. 337, fig. 4) which have been separated as *A. macrourus* Michx., var. *glaucopsis* Ell. Sk. i. 150 (1816) and Hack. l. c. 409 (1889) or *A. glomeratus glaucopsis* (Ell.) Mohr, Bull. Torr. Bot. Cl. xxiv. 21 (1897). Although Nash subsequently made the combination *A. glaucopsis* (Ell.) Nash in Small Fl. Se. U. S. 62 (1903), it is apparent from his subsequent merging of his own *A. glaucopsis* with his earlier-published and very different *A. capillipes* Nash (pl. 337, fig. 2), that his conception was a confused one, that glaucousness alone, regardless of other characters, was relied upon by him. True *A. macrourus*, var. *glaucopsis* was placed by Elliott and, following him, by Hackel under *A. macrourus* Michx. because the inflorescence has a tendency to produce glomerulate clusters. Examination of the type of *A. macrourus* shows that this identification was correct. Although theoretical *A. glomeratus* should have the leaves overtopping the inflorescence and the spathes scabrous, much of *A. macrourus* and material transitional to it has the leaves short and the spathes quite smooth, though the leaves in the extreme plant are very strongly pruinose-glaucous. It is this transitional series, very clearly described by Hackel as having a loose inflorescence and the spathes smooth, a characteristic of *A. virginicus* ("vaginis laminisque subtus valde pruinosus, glabris; panicula varietatis α [true *A. macrourus*], sed laxior"), extending north along with *A. virginicus*, var. *tetrastachyus* and true *A. macrourus* (pl. 337, fig. 4) to southeastern Virginia,

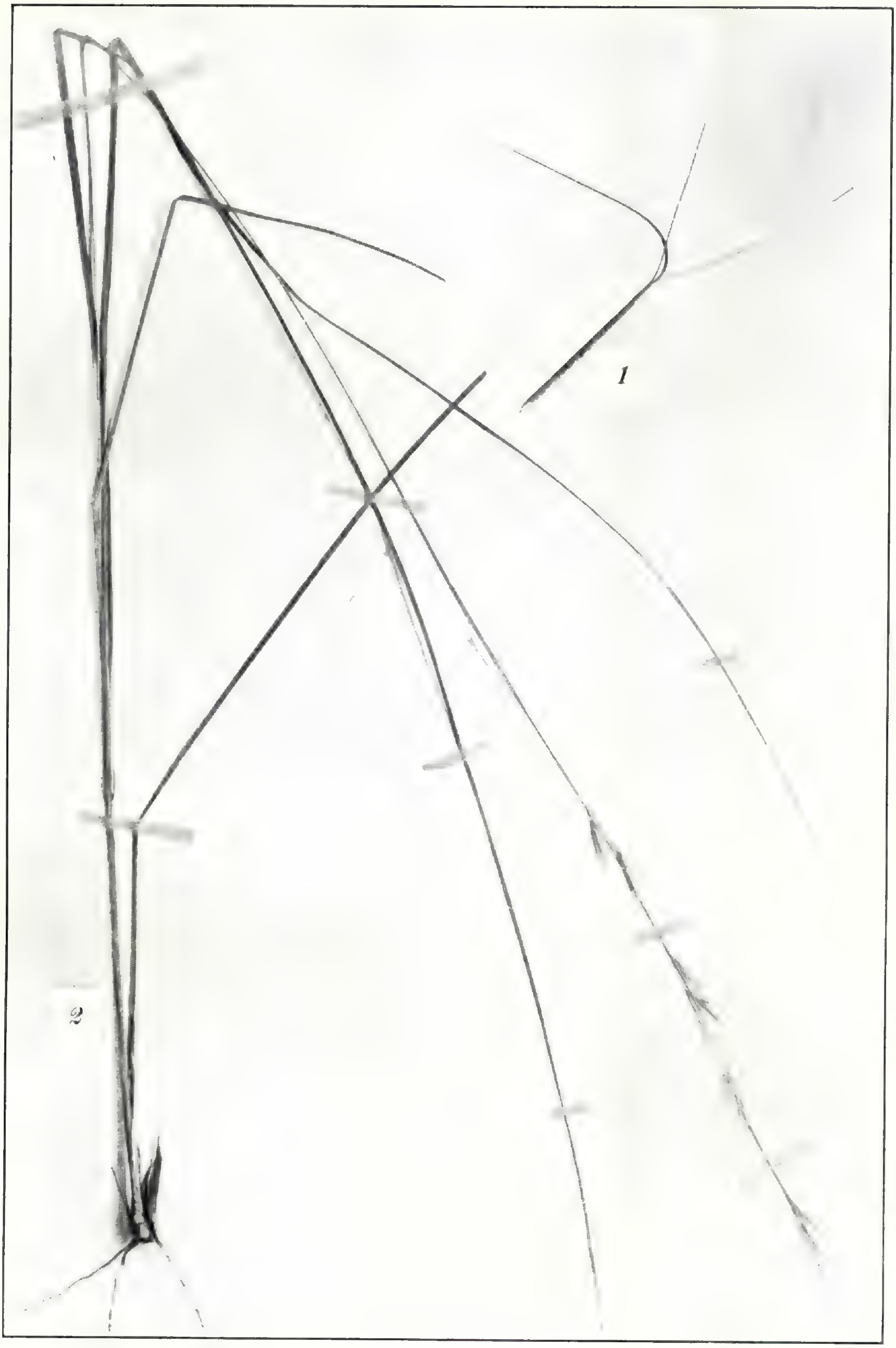

Photo. *J. F. Collins.*

Aristida lanosa, var. macera: fig. 2, plant, × ½; fig. 1, lemma, × 2.

Photo. *J. F. Collins.*

Echinochloa pungens, var. coarctata: fig. 1, panicle, × 1; fig. 2, spikelet, × 10.
E. pungens, var. ludoviciana: fig. 3, spikelet, × 10.

which makes it quite impossible to keep apart as valid species *A. virginicus* and *A. glomeratus*.

As a natural step from *A. glomeratus*, var. *glaucopsis* we pass in the same southern region directly to the much commoner var. *tenuispatheus* (PL. 338, FIG. 1), which usually has the inflorescence denser and thicker and more markedly glomerulate and which lacks the very pronounced bloom of var. *glaucopsis*. The var. *tenuispatheus* has the inflorescence elongate-ellipsoid, commonly 2–8 dm. long, but both northward and southward it passes imperceptibly into extremes with greatly shortened and corymbiform or turbinate panicles. The northern extreme (PL. 338, FIG. 3), with highly scabrous spathes is *A. macrourus*, var. *abbreviatus* Hack. l. c. 408 (1889). It has its greatest development from the District of Columbia and southern New Jersey to southeastern Massachusetts. Much farther south, especially from Florida to Texas, a similar extreme (PL. 338, FIG. 2), with exactly similar inflorescences, var. *corymbosus* Chapm. in Hack. l. c. 409 (1889), differs only in having the spathes smooth as in *A. virginicus*.

In the extreme South some other local variations of *A. virginicus* occur, which have been treated as distinct species, but these, having the simple inflorescences and smooth spathes of typical *A. virginicus*, do not specially concern us here. In order to show the variations (often treated as species) which seem to us to break down the reputed specific lines between *A. virginicus* and *A. glomeratus*, Professor J. F. Collins has most kindly supplied the photographs of typical panicles, × ½, reproduced as PLATES 337 and 338.

As we understand *Andropogon virginicus* it consists of the following variations which seem most worthy of recognition.

a. Inflorescence simple or subsimple: culms slender: plants of dry soil.
  Leaves flat, 2–5 mm. broad . . . . *A. virginicus*, var. *genuinus*.
  Leaves subfiliform, canaliculate, 1–2 mm. wide . . . . Var. *stenophyllus*.
a. Inflorescence branching, loosely to densely paniculate or corymbiform . . . . *b*.
  b. Branches of panicle never glomerulate: culms slender: plants of dry soil.
    Racemes only 1.5–2 cm. long . . . . Var. *glaucus*.
    Racemes 2.5–4 cm. long . . . . Var. *tetrastachyus*.
  b. Branches of panicle from slightly to strongly glomerulate or corymbiform: culms stout: plants mostly of wet pine barrens or swamps . . . *c*.
    c. Inflorescence elongate, not corymbiform: upper leaves shorter than to overtopping the culm.
      Leaves, especially of basal tufts, heavily white-pruinose: inflorescence rather lax, its upper half only 4–6 cm. in diameter . . . . Var. *glaucopsis*.

Leaves green or only slightly glaucous: inflorescences usually dense, their upper halves 0.6–2 dm. in diameter . . . . Var. *tenuispatheus*.
c. Inflorescence strongly corymbiform or subturbinate, often strongly overtopped by the upper leaves.
Spathes smooth . . . . Var. *corymbosus*.
Spathes strongly scabrous . . . . Var. *abbreviatus*.

A. virginicus L., var. **genuinus**. *A. virginicus* L. Sp. Pl. i. 1046 (1753). Var. *viridis*, subvar. *genuinus* Hack. in DC. Monogr. Phan. vi. 410 (1889).—Rather general in the Southern States, extending north on dry soils to Massachusetts, New York, Ohio, Indiana and Missouri; also Mexico. Pl. 337, fig. 1.

Var. **stenophyllus** (Hack.), comb. nov. *A. virginicus*, var. *viridis*, subvar. *stenophyllus* Hack. l. c. 411 (1889). *A. perangustatus* Nash in Small, Fl. Se. U. S. 62 (1903).—Georgia and Florida to Mississippi.

Var. glaucus Hack. l. c. 411 (1889). *A. capillipes* Nash, Bull. N. Y. Bot. Gard. i. 431 (1900).—North Carolina to Florida and Mississippi. Pl. 337, fig. 2.

Var. tetrastachyus (Ell.) Hack. l. c. 411 (1889). *A. tetrastachyus* Ell. Sk. i. 150 (1816). *A. longiberbis* Hack. Flora, lxviii. 131 (1885) *A. virginicus*, var. *viridis*, subvar. *ditior* Hack. l. c. 411 (1889). *Sorghum longiberbe* (Hack.) Kuntze, Rev. Gen. 792 (1891).—General in the Southern States, extending north to southeastern Virginia, Tennessee, southern Illinois, Missouri and Oklahoma; also in Mexico. Our collection from Virginia is: dry pine barrens, Cape Henry, no. 2764. Pl. 337, fig. 3.

Var. glaucopsis (Ell.) Hitchc. Am. Journ. Bot. xxi. 139 (1934). *A. macrourus* Michx. Fl. Bor.-Am. i. 56 (1803). *A. macrourus glaucopsis* Ell. Sk. i. 150 (1816); Hack. l. c. 409 (1889). *A. glaucopsis* (Ell.) Nash in Small, l. c. 62 (1903), at least as to name-bringing syn.—Very local, Florida to southeastern Virginia. Our collection from Virginia: edge of brackish marsh, Pungo Ferry, no. 2765. Pl. 337, fig. 4.

Var. **tenuispatheus** (Nash) comb. nov. *A. glomeratus tenuispatheus* Nash in Small, Fl. Se. U. S. 61 (1903). *A. tenuispatheus* Nash in N. Am. Fl. xvii[2]. 113 (1912).—General in marshes and damp pine barrens in the Southern States, westward to southern Nevada and southern California and Mexico, north to southeastern Virginia and Arkansas. Our collection from Virginia: upper border of brackish marsh, Kempsville, no. 2766. Pl. 338, fig. 1.

Var. tenuispatheus, forma **hirsutior** (Hack.), comb. nov. *A. macrourus* γ, *hirsutior* Hack. l. c. 409 (1889).—Like var. *tenuispatheus* but sheathes conspicuously villous.—Georgia, Florida and Alabama.

Var. **corymbosus** (Chapm.), comb. nov. *A. macrourus*, ε, *corymbosus* Chapm. in Hack. l. c. 409 (1889). *A. corymbosus* (Chapm.) Nash in Britt. Man. 69 (1901), in part (as to southern plant).—Wet pine barrens, Florida to Arkansas, Texas and Mexico. Pl. 338, fig. 2.

Var. **abbreviatus** (Hack.), comb. nov. *Cinna glomerata* Walt.

Fl. Carol. 59 (1788), the type examined by the junior author in 1934. *A. glomeratus* (Walt.) B. S. P. Prelim. Cat. N. Y. 67 (1888). *A. macrourus* β, *abbreviatus* Hack. l. c. 408 (1889).—Marshes and wet pine barrens, southeastern Massachusetts to District of Columbia and North Carolina. Pl. 338, fig. 3.

The Variations of Andropogon scoparius (Plates 339 and 340). —In 1917 Mr. F. Tracy Hubbard pointed out that the typical *Andropogon scoparius* is the rather local plant of the Atlantic seaboard with strongly villous sheaths and blades. At that time Hubbard designated the widespread glabrous plants as var. *frequens* Hubbard, Rhodora, xix. 103 (1917), and concluded his article with a long discussion of var. *polycladus* Scribn. & Ball, to which he reduced the very striking plant of the northeastern seabeaches, *A. littoralis* Nash. His remarks, however, and the specimens he cited (omitting any citations from the type-region) indicate that his conception of var. *polycladus* had little to do with the plant of Scribner & Ball. In fact, Hubbard's citations show that any luxuriant or bushy-branched specimen of at least four well defined geographic varieties was called by him var. *polycladus*. Furthermore, the range given and the specimens labelled by him as var. *frequens* show that this concept was also a composite one. In attempting to make out the identities of our recent collections we have found that the species, *A. scoparius*, breaks into the following confluent but geographically somewhat isolated varieties, two of which are treated by Nash as species distinct from *A. scoparius*.

a. Joints of rachis beardless for the basal third, the bearding relatively sparse and short, grayish-white: robust plants chiefly of southern range.
Sheaths copiously villous: inflorescence relatively simple, with few appressed-ascending branches . . . . Var. *genuinus*.
Sheaths glabrous or more or less pubescent: inflorescence with very forking fastigiate branches, the lateral branches often horizontally divergent . . . . Var. *divergens*.
a. Joints of rachis bearded nearly or quite to base, the bearding often longer and whiter: usually more slender plants of northern or inland range. . . . *b*.
b. Glumes of fertile spikelet 4.5–6 mm. long: sterile rudiment, including awn, 2.5–5.5 mm. long: bearding comparatively sparse and short . . . . Var. *frequens*.
b. Glumes of fertile spikelet 6–11 mm. long: sterile rudiment, including awn, 3–10.5 (usually 6 or more) mm. long: bearding abundant and long. . . . *c*.
c. Racemes with 5–10 fertile spikelets, usually very flexuous; glumes 7–10 mm. long: rudiment 6.5–10.5 mm. long. Var. *septentrionalis*.
c. Racemes with (8–)11–19 fertile spikelets, rarely flexuous. . . . *d*
d. Inflorescence elongate, simple or subsimple, its branches little, if at all, fastigiate: rudiment 3–4.5 mm. long: plant of interior and western area. . Var. *neo-mexicanus*.

d. Inflorescence shorter, with abundant fastigiate branching: rudiment 5–8.5 mm. long: plants of Atlantic coast.
Sheaths only slightly compressed, often green: lower cauline blades barely exceeding the sheaths: glumes 6–8 mm. long . . . . Var. *ducis*.
Sheaths strongly compressed, usually very glaucous: lower cauline blades greatly exceeding the sheaths: glumes 8.5–10 mm. long . . . . Var. *littoralis*.

Var. **genuinus**. *A. scoparius* Michx. Fl. Bor.-Am. i. 57 (1803). *Pollinia scoparia* (Michx.) Spreng. Pug. ii. 13 (1815). *A. scoparius*, subsp. *genuinus*, forma or subvar. *typica* Hackel in DC. Monogr. Phan. vi. 385 (1889). *Sorhgum scoparium* (Michx.) Kuntze, Rev. Gen. 792 (1891). *A. scoparius villosissimus* Kearney ex Scribn. & Ball, Bull. U. S. Div. Agrost. 24: 41 (1900); Hubbard, Rhodora, xix. 101 (1917). *Schizachyrium scoparium* (Michx.) Nash in Small, Fl. Se. U. S. 59 (1903), at least as to source of name. *S. villosissimus* (Kearney) Nash, l. c. (1903).—Gulf States, locally north to Missouri and Kentucky and along the coast to Connecticut and Dukes and Nantucket Cos., Massachusetts. Plate 339, fig. 4.

The typical *A. scoparius* possibly extends farther north in the interior. Numerous specimens cited by Hubbard seem to be slightly pubescent individuals of other varieties, which differ from var. *genuinus* in characters of the racemes.

Var. divergens Hackel, l. c. 385 (1889). *A. divergens* Anderss. ex Hackel, l. c. as syn. Var. *polycladus* Scribn. & Ball, Bull. U. S. Div. Agrost. 24: 40 (1900); Hubbard, l. c. 103 (1917), in small part only.—Florida to Texas and Mexico, northward to Arkansas and, very locally, to Delaware Co., Pennsylvania. Plate 340, fig. 3.

The type-sheet of var. *polycladus* has been most kindly loaned to us by Professor Hitchcock. Its characteristic branching and robust stature indicate its identity with Hackel's *A. scoparius*, subsp. *maritimus*, β. *divergens* from Texas, characterized by "Rami floriferi robustiores, ... racemi robustiores . . . Paniculae pauperae rami bini, primarii 2–3-nodes, hinc inde ramulosi." This very striking variety has had an unfortunate career, being either completely ignored or quite misinterpreted.

Var. frequens Hubbard, Rhodora, xix. 103 (1917), as to type, but otherwise only in small part. *A. purpurascens* Muhl. in Willd. Sp. Pl. iv. 913 (1806). *A. flexilis* Poir. in Lam. Encyc. Suppl. i. 583 (1810). *A. scoparius*, subsp. *genuinus*, forma vel subvar. *flexilis* (Poir.) Hackel, l. c. 384 (1889).—Western New Hamsphire and eastern Massachusetts to central New York and locally to Minnesota, south to Florida, Alabama and Mississippi. Plate 339, fig. 3.

Hubbard's var. *frequens* included this and the next three varieties. The type (Block Island, *Fernald, Long & Torrey*, no. 8476) is the

Photo. *J. F. Collins.*

ANDROPOGON VIRGINICUS AND VARIETIES; panicles, × ½.
FIG. 1, var. GENUINUS; FIG. 2, var. GLAUCUS; FIG. 3, var. TETRASTACHYUS; FIG. 4, var. GLAUCOPSIS.

Photo. *J. F. Collins.*

ANDROPOGON VIRGINICUS AND VARIETIES; panicles, × ½.
FIG. 1. var. TENUISPATHEUS; FIG. 2, var. CORYMBOSUS; FIG. 3, var. ABBREVIATUS.

common and characteristic extreme in most of the eastern states, becoming rare westward and apparently unknown southwestward, or northeast of western and southern New England.

Var. **septentrionalis**, var. nov. (TAB. 339, FIGS. 1 et 2), var. *frequenti* simillima a·qua differt racemis laxis flexuosis; spiculis sessilibus 7–10 mm. longis; spiculis pedicellatis rudimentariis arista inclusa 6.5–10.5 mm. longis; rachillae pilis valde longioribus densioribusque.—St. John Valley, New Brunswick to Michigan, south to northeastern Massachusetts, western Connecticut and northeastern New York. TYPE: Baie Sherley, Riv. Ottawa, QUEBEC, 15 sept. 1925, *Rolland*, no. 19,199 (in Gray Herb.). Nearly all specimens seen from Quebec, Maine and New Hampshire, and all from New Brunswick belong here as do the following: VERMONT: Burlington, 1883, *Brainerd;* Norwich, 1889, *M. A. Loveland;* West Townshend, 1915, *Wheeler.* MASSACHUSETTS: Salisbury, *Donald White*, no. 340; Malden, 1880, *H. A Young;* Randolph, 1898, *Churchill.* CONNECTICUT: Middletown, 1903, *Driggs.* NEW YORK: Lake George, 1900, *E. C. Kent;* Hudson Falls, 1899, *Burnham.* ONTARIO: Squirrel Island, Lambton Co., 1908, *C. K. Dodge.* MICHIGAN: Cheboygan Co., 1870, *Beardslee.*

Var. NEO-MEXICANUS (Nash), Hitchc. Proc. Biol. Soc. Wash. xli. 163 (1928). *A. neo-mexicanus* Nash, Bull. Torr. Bot. Cl. xxv. 83 (1898). *Schizachyrium neo-mexicanum* Nash in N. Am. Fl. xvii[2]. 107 (1912).—The characteristic variety of the Rocky Mountain and Great Plains region, extending eastward along the Great Lakes to Lake Erie (Ontario, Ohio and Pennsylvania); apparently isolated in the Ottawa Valley and in the Androscoggin Valley, Maine. The extreme eastern collections are: QUEBEC: Ironside, valley of the Gatineau, *Rolland*, no. 15,291. MAINE: Gilead, 1897, *Kate Furbish.* PLATE 339, FIG. 5.

Var. **ducis**, var. nov. (TAB. 340, FIGS. 1 et 2), humilis; inflorescentiis fastigiatis; foliis viridiscentibus, laminis quam vaginis glabris et paullo compressis parum longioribus; spiculis sessilibus 6–8 mm. longis; spiculis pedicellatis rudimentariis arista inclusa 5–7.5 mm. longis.—Dukes, Nantucket and Barnstable Counties, MASSACHUSETTS. TYPE: steep, sandy bank, east side of West End Point, Naushon, August 31, 1927, *J. M. Fogg, Jr.*, no. 2940 (in Gray Herb.).

Most of the specimens from Dukes County (Martha's Vineyard and the Elizabeth Islands) are thoroughly characteristic, but some from Cape Cod are transitional to var. *frequens.* Var. *ducis* has often been mistaken for the more southern var. *littoralis* (including a part of var. *polycladus* of Hubbard), but it differs strikingly in its greener color, less compressed sheaths, shorter blades and shorter glumes. We have seen no material from Nantucket, but Bicknell's comment upon reporting *Schizachyrium littorale* from there was to the point: "Specimens collected are less notably different from *S.*

scoparium than are strongly developed examples from the Long Island and New Jersey coasts." Bicknell's observation thus coincides with our own, that var. *ducis* is intermediate between vars. *frequens* and *littoralis.*

Var. littoralis (Nash) Hitchc. Rhodora, viii. 205 (1906). *A. littoralis* Nash in Britt. Man. 69 (1901). *Schizachyrium littorale* (Nash) Bickn. Bull. Torr. Bot. Cl. xxxv. 182 (1908), as to type.—Beaches and dunes, southern Connecticut to southeastern Virginia. Plate 340, fig. 4.

Var. *littoralis* is so pronounced in its extreme development as to appear specifically distinct from the other varieties which are geographically adjacent, such, for instance, as vars. *divergens* and *frequens.* As will be seen, however, from an inspection of the key, vars. *septentrionalis, neo-mexicanus* (which on the sands of the Great Lakes has been identified as var. *littoralis*) and *ducis* completely bridge the morphological differences between these marked extremes. As already noted, on Cape Cod var. *ducis* clearly passes into the continental var. *frequens;* furthermore, the only Connecticut material we have seen of var. *littoralis* is greener than the plants of southern New York, New Jersey, Delaware and Virginia and is thus transitional to var. *ducis.*

Variations of Andropogon provincialis.—The common grass which has long been known as *Andropogon furcatus* Muhl. (1806) must, unfortunately, take the earlier and inappropriate name *A. provincialis* Lam. (1783). This was based on specimens in cultivation or escaped from cultivation in Provence in southern France. Although Hackel treats the common *A. furcatus* of eastern America as a subvariety, the slight character which he ascribes to the plant introduced into France is found in a large number of American specimens. The native American plant is currently divided by Nash into four so-called species: *A. provincialis, A. chrysocomus* Nash, *A. tennesseensis* Scribn. and *A. paucipilus* Nash. Of these, *A. tennesseensis* is so trivial a variation, by no means confined to Tennessee, that it seems unworthy of recognition even as a form, a course just taken by Hitchcock in Small's Manual.

A. paucipilus is a well marked, rare and local extreme of Nebraska and Montana; but aside from its essentially glabrous racemes, the internodes with at most a few weak hairs, it has no morphological characters to separate it from the less pubescent tendencies of *A. provincialis.*

A. chrysocomus is a striking variation in the opposite direction, with the hairs of the internodes of the rachis more abundant, twice as long as in typical *A. provincialis* and, in its extreme development, yellowish in color. Except for the extreme development of beard there seems to be nothing to separate *A. chrysocomus* from *A. provincialis*.

The two extreme variations seem to us better treated as

A. PROVINCIALIS Lam., var. **paucipilus** (Nash), comb. nov. *A. paucipilus* Nash in Britt, Man. 70 (1901).

A. PROVINCIALIS Lam., var. **chrysocomus** (Nash), comb. nov. *A. chrysocomus* Nash, l. c. (1901).

Nash gives the range of the latter as "Nebraska and Wyoming to Texas," but recent collections show that it extends into southwestern Missouri.

CYPERUS IRIA L., var. **Santonici** (Rottb.), comb. nov. *C. Santonici* Rottb. Descr. Icon. Nov. Pl. 41, t. ix. fig. 1 (1773).

Botanists of the Orient have long recognized two marked trends in *Cyperus Iria*, which have been ignored by New World students. The commoner extreme is the slender-spiked plant which was beautifully illustrated by Plukenet. Linnaeus also cited a plate of Rheede, which, according to C. B. Clarke, is *C. inundatus* Roxb. Since Linnaeus had no specimens, the Plukenet plate must stand as the type. The typical variety, common in southeastern Asia as well as the southeastern United States, has the very short spikelets (2–10-flowered) practically sessile and alternately and irregularly crowded on both sides of the ultimate branches of the umbel, forming slender spiciform branches.

The other extreme, *Cyperus Santonici*, has much longer linear spikelets (10–22-flowered), terminating the ultimate branches of the umbel, forming shorter and thicker and looser ultimate racemes. Students of the oriental flora have treated this variety as typical *C. Iria*, and have considered the slender-spiked *C. Iria* as var. *microiria* (Steud.) Franchet & Savatier or as var. *paniciformis* (Franch. & Sav.) Clarke, or even as a separate species, *C. microiria* Steud. or *C. paniciformis* Franch. & Sav.

Typical *Cyperus Iria* is well known in our southeastern states, though it is significant that in 1860 Chapman knew of only a single station (Santee Canal), where it was considered as "Probably introduced from Eastern Asia." The abundance of the plant on roadsides and in clearings from North Carolina southward indicates a rapid naturalization.

The plant of southeastern Virginia (our nos. 2783–2785) proves to be not the typical *C. Iria* but the var. *Santonici*, which apparently has not been previously collected in America.

Hitherto the only basis for the inclusion of *C. Iria* in the Gray's Manual range has been a single collection at Hempstead, Long Island, first recorded in the 2nd edition of Britton & Brown's Illustrated Flora, a weed in a potato field, found by the late E. P. Bicknell in 1907. This plant, a sheet of which is before us, proves to be neither typical *C. Iria* nor var. *Santonici*, but is referable to *C. amuricus* Max. Prim. Fl. Amur. 296 (1859), a close relative of *C. Iria*, with which it has often been confused. One of the original specimens of *C. amuricus*, in the Gray Herbarium, is closely matched by Japanese material, differing at once from *C. Iria* in the prolonged midribs of the scales which project as definite cusps or mucros. *C. amuricus*, like *C. Iria*, seems to have a weedy tendency and is introduced in Italy, being *C. Iria*, var. *acutiglumis* Fiori, Fl. Ital. Exsicc. Ser. II. no. 1231 (1908). The plant, however, had an earlier varietal designation in *C. amuricus*, var. *iaponicus* Miq. Prolus. Fl. Jap. (1866–67), which was based on a trivial difference in color of the scales.

Cyperus ferax and C. ferruginescens.—The annuals variously known in American floras as *Cyperus ferax* Richard, Act. Soc. Hist. Nat. Paris, i. 106 (1792), *C. speciosus* Vahl, Enum. ii. 364 (1806) and *C. Michauxianus* Schultes, Mantissa, ii. 123 (1824) have never been clearly understood. Material identified under any one of these names occurs in our older herbaria, with an undifferentiated range from the Atlantic to the Pacific and south throughout tropical America; in habitat ranging from salt marsh to rich river-alluvium and prairie. In attempting to identify our own material it has been necessary to trace the various names to their sources.

C. ferax, the earliest described of the series, came originally from Surinam (Dutch Guiana), and an excellent photograph of the type (received through the Rockefeller Foundation and the Field Museum) shows it to be the plant characteristic of brackish or saline shores from tropical America north to Massachusetts and on the Pacific coast to California. This species is characterized by its coriaceous or subcoriaceous scales which are 2–3.5 mm. long, drab to brownish and inclined to be lustrous. Its achenes are 1.5–2 mm. long, ellipsoid to very narrowly obovoid, dull gray to blackish when ripe, with relatively coarse superficial pebbling.

Cyperus speciosus was described from Virginia, where *C. ferax* is

Photo. *J. F. Collins.*

ANDROPOGON SCOPARIUS AND VARIETIES; branches, × ½; racemes, × 2.
FIGS. 1 and 2, var. SEPTENTRIONALIS; FIG. 3, var. FREQUENS; FIG. 4, var. GENUINUS; FIG. 5, var. NEO-MEXICANUS.

Photo. *J. F. Collins.*

ANDROPOGON SCOPARIUS AND VARIETIES; habit, × ½; racemes, × 2.
FIGS. 1 and 2, var. DUCIS; FIG. 3, var. DIVERGENS; FIG. 4, var. LITTORALIS.

abundant on the coast, as having the scales of the spikelets "linear" and leaves of the involucre only 2 lines wide. Torrey, following Elliott, applied this name to plants of the South "bearing conspicuous partial as well as general involucres." We know that in well developed umbels *C. ferax* may have them. Torrey did not know of *C. ferax* Richard and he applied to the smaller coastal plant with only primary involucres the name *C. Michauxianus* Schultes. This latter name was a substitute for *C. strigosus* Michx., not L.

In his extensive publication on the *Cyperaceae* of the Berlin Herbarium, Boeckeler performed some remarkable nomenclatural shuffles, restricting *C. ferax* to South America, and using the combination *C. Michauxianus* Torr. ("excl. syn Schult."), in spite of the fact that Torrey had explicitly stated that his *C. Michauxianus,* like that of Schultes, "is clearly the *C. strigosus* of Michaux, as I have ascertained by examining his herbarium." Of course *C. Michauxianus* of Torrey and of Schultes, earlier, are identical, being based on the identical type. Nevertheless, Boeckeler refrained from stating what he took to be *C. Michauxianus* of Schultes.

After attempting to find any character to distinguish these various plants we are forced to treat them as a single wide-ranging species for which *C. ferax* is the earliest name.

As to *Cyperus speciosus,* which Vahl based upon a specimen "ex herbario horti parisini," letters to Paris have brought the uniform reply that the type could not be found. The junior author, when in Paris in July, 1934, made a special search for this sheet with the expert assistance of Monsieur Léandri. It was finally located, but has always been previously overlooked, as the name *C. speciosus* does not occur on the sheet, nor did Vahl make any annotations. The evidence for this sheet being Vahl's type is as follows. There is only one label, bottom, left, in ink, which reads

Trasi Virgin. panic. speciosa sparsa herbier du Vaillant.

Now, Vahl, Enum. ii. 364 cites *C. specious* as being *ex herb. Vaillant,* and uses the same words in his third paragraph of diagnosis, merely substituting "*Cyperus*" for "*Trasi:*"

Cyperus virginianus panicula sparsa speciosa Herbarium Vaillantii.

Finally, this is the only Vaillant specimen of the species *C. ferax* and all its synonyms in the Museum.

The plant on the sheet is the culm and 2 inches of stem of a very large and long-branching specimen of *Cyperus ferax* with long spikes,

consequently lacking the congested appearance of many plants of that species. In technical characters it is NOT *C. erythrorhizos* nor *C. ferruginescens* but is the familiar *C. ferax* at a glance.

Boeckeler described two new species, *Cyperus ferruginescens*, Linnaea, xxxvi. 396 (1869–70) and *C. parvus*, l. c., both based on material sent by Engelmann from St. Louis, Missouri. The latter is clearly nothing but a depauperate state of the former. A sheet of the type-collection of *C. ferruginescens*, gathered by Engelmann near St. Louis, Missouri, in September, 1845 and sent to Gray as *C. Michauxianus* Schult. is a characteristic specimen of a species with small, opaque and membranaceous, instead of coarser, lustrous and coriaceous scales, which rarely exceed 2 mm. in length. The inflorescence of *C. ferruginescens* usually has a positively ferruginous coloring, that of *C. ferax* being drab to fuscous or, in the other direction, yellowish; the achenes of *C. ferruginescens* are also ferruginous or golden-brown, 1–1.5 mm. long, and shorter-oblong. *C. ferruginescens* occurs chiefly in the richer soils of the interior, coming eastward to the Connecticut and the Potomac valleys and extending westward to the Pacific. It has been distributed as *C. speciosus*, *ferax* or *erythrorhizos*, all of which it superficially simulates. In 1886 Dr. Britton considered it only a variety of *C. speciosus* Vahl, calling it *C. speciosus*, var. *squarrosus* Britt., Bull. Torr. Bot. Cl. xiii. 214 (1886); but he was then treating *C. speciosus* (including *C. speciosus*, var. *parvus* (Boeckl.) Britt. l. c.) as specifically distinct from *C. ferax* Richard.

The Variations of Cyperus strigosus (Plate 341). The widely dispersed species, *Cyperus strigosus* L. Sp. Pl. i. 47 (1753), has had many varieties proposed and at least three specific segregates. In searching for morphological characters to separate all these concepts we have spent many days in a study of the series. *C. strigosus* var. *capitatus* Britton, Bull. Torr. Bot. Cl. xiii. 221 (1886), wrongly ascribed to Boeckeler, who gave no name to it, seems to us only starved individuals with congested inflorescences. Var. *compositus* Britton, l. c., as shown by specimens so identified by Dr. Britton, is a series of more luxuriant plants with a compound umbel; while var. *gracilis* Britton, l. c. is another depauperate (or "drawn") state.

Var. *elongatus* (Torr.) Britton, l. c. was based on *C. Michauxianus*, β. ? *elongatus* Torr. Ann. Lyc. N. Y. iii. 432 (1836). Whether Torrey's type (*Drummond*, no. 337, from Texas) belonged to *C. strigosus* seems very doubtful. Torrey explicitly said of it: "much resembles *C.*

strigosus . . . but in the structure of the spikelets, it is nearer *C. Michauxianus*"; and Britton stated that he had never seen the Torrey type. Neither have we been able to locate it. Var. *robustior* Britton, l. c., based on *C. strigosus* β. Kunth, Enum. ii. 88 (1837), seems to be a well defined geographic variety, characterized by its very long (10–25-flowered) spikelets which are 2–3 cm. long; it is essentially a plant of the southeastern coastal plain, north locally to Martha's Vineyard and, in the interior, to southern Indiana and Missouri. Much of the material so named in collections is merely large *C. strigosus*.

One of the great technical difficulties in this species and its allies is the fact that quite immature specimens have subterete and not strongly compressed spikelets; consequently, immature specimens cannot be identified by keys which, in so technical a group, have to be based on mature fruiting material. On at least two occasions supposed new species have been based on such immature specimens. *C. uniflorus* Torr. & Hook. in Torr. l. c. 431 (1836), of which an isotype (our FIG. 2) is before us, was based on *Drummond's* no. 287 from Texas. It is wholly immature and is quite inseparable from much material in similar development from the northeastern states (see FIGS. 4 and 7). *C. Hanseni* Britton in Abrams, Ill. Fl. Pacif. States, i. 260, fig. 621 (1923), was based upon immature material ("young achene narrowly linear") from Amador County, California, with a stated range including Shasta Co. and the Sacramento Valley. Some of the earlier collections had been erroneously referred to C. *stenolepis* Torr. by Sereno Watson. This and some other material is before us and, again, it (see FIG. 5) is absolutely indistinguishable from innumerable immature specimens of *C. strigosus* from the breadth of the continent (FIG. 7 from Massachusetts).

Cyperus stenopelis Torr. l. c. 263 (1836) is in many ways the most extreme variety of *C. strigosus,* usually maintained as a species in works on the southern flora. It is characterized by luxuriant development, with the very numerous spikelets becoming lax, and with loosely spreading scales in maturity. In typical form it occurs chiefly from Florida to Louisiana, but it extends northward to North Carolina (whence the type) and locally to West Virginia. Dr. Gleason informs us that the type specimen cannot be found in the Torrey Herbarium; but Britton, in his synopsis of the genus, accepted it in the sense defined above and, until the type is discovered and proves to be something different, the name should be applied in its current sense. We agree with Kükenthal in treating it as *C. strigosus,* var. *stenolepis* (Torr.) Kükenth. in Fedde, Rep. Spec. Nov. xxiii. 189 (1926).

Cyperus retrorsus and its Variations (Plate 342). The widespread species long known as *Cyperus cylindricus* (Ell.) Britton, Bull. Torr. Bot. Cl. vi. 339 (1871) became *C. Torreyi* Britton, Bull. Torr. Bot. Cl. xiii. 215 (1886) because of the earlier and different *C. cylindricus* Boeckl. (1859). In studying this variable species we have been unable, however, to keep *C. Torreyi* (1886) apart from *C. retrorsus* Chapm. Bot. Gaz. iii. 17 (1878). The latter (our figs. 1 and 2) represents one extreme of a series which includes the species *C. Nashii* Britton (figs. 3 and 4), *C. Deeringianus* Britton & Small (figs. 7 and 8) and *C. Torreyi* Britton (figs. 5 and 6), as treated in Small's Manual. So far as we can determine there are no fundamental differences between these plants, each of which has a distinctive range; and abundant intergradient specimens occur. As we should treat *C. retrorsus* it consists of the following varieties.

C. retrorsus Chapm., var. **typicus**. *C. retrorsus* Chapm. Bot. Gaz. iii. 17 (1878). *C. retroversus* Chapm.[1] Fl. So. U. S. ed. 2, 1st Suppl. 659 (1883), obvious *lapsus* for *C. retrorsus*, corrected in ed. 3.—Spikelets very densely crowded, the lower becoming reflexed, 2–3.5 mm. long, forming slenderly cylindric to slightly clavate spikes 0.9–2 cm. long.—Florida to Alabama and South Carolina (fragment of type at New York Bot. Gard. examined through courtesy of Dr. Gleason). Figs. 1, × 1, and 2, × 4, from Florida material closely matching Chapman's type.

Var. **Nashii** (Britton), comb. nov. *C. Nashii* Britton in Small, Fl. Se. U. S. 1321 and 1329 (1903).—Spikelets less crowded, 2–3.5 mm. long, the lower more spreading, in ellipsoid-cylindric spikes 4–9 mm. long.—Heretofore recorded only from central Florida, but now extended north to southeastern Virginia: Virginia Beach, *Randolph*, no. 324; Cape Henry, *Fernald & Griscom*, no. 2792, *Fernald & Long*, no. 3730. Figs. 3, × 1, and 4, × 4, from duplicate type of *C. Nashii*.

Var. **cylindricus** (Ell.), comb. nov. *Mariscus cylindricus* Ell. Sk. Bot. S. C. and Ga. i. 74 (1816). *C. ovularis*, γ *cylindricus* (Ell.) Torr. Ann. Lyc. N. Y. iii. 279 (1836). *C. cylindricus* (Ell.) Britton, Bull. Torr. Bot. Cl. vi. 339 (1879), not Boeckl. (1859). *C. Torreyi* Britton, Bull. Torr. Bot. Cl. xiii. 215 (1886).—Spikelets less crowded than in var. *typicus*, 3–5 mm. long, the lower rarely much reflexed, forming short-cylindric spikes 0.5–1.5 cm. long.—Texas to Florida, north to southern New York. Figs. 5, × 1, and 6, × 4, from type region (Georgia) of *Mariscus cylindricus* Ell.

Var. **Deeringianus** (Britton & Small), comb. nov. *C. Deeringianus* Britton & Small in Small, Man. 151 and 1503 (1933). *C. cylindrostachys* Am. auth., not Boeckl. (1869–70). The coarsest and largest extreme, with spikelets 4–5 mm. long, the lower reflexed as in var.

[1] Name not in *Index Kewensis*.

Photo. *E. C. Ogden.*

UMBELS OF CYPERUS STRIGOSUS, × 1: FIG 1, TYPE in Herb. Linnaeus; FIG. 2, *isotype* of *C. uniflorus*, from Texas; FIG. 3, immature umbel of *C. uniflorus*, from Texas; FIG. 4, immature umbel, from Maine; FIG. 5, umbel of *C. Hanseni*, from California; FIG. 6, immature umbel, from Mississippi; FIG. 7, immature umbel, from Massachusetts.

Photo. *E. C. Ogden.*

VARIETIES OF CYPERUS RETRORSUS; umbels, × 1; spikes, × 4.

Var. TYPICUS: FIGS. 1 and 2, from Florida.
Var. NASHII: FIGS. 3 and 4, from Florida (ISOTYPE).
Var. CYLINDRICUS: FIGS. 5 and 6, from Georgia.
Var. DEERINGIANUS: FIGS. 7 and 8, from Virginia.

typicus, forming simple or basally compound ellipsoid to long-cylindric spikes 1–3 cm. long.—Mississippi to Florida and Georgia, here extended north to southeastern VIRGINIA: wet clearings near Grassfield, Norfolk Co., *Fernald & Long*, nos. 3723, 3724; near Great Bridge, Norfolk Co., *Fernald & Long*, no. 3725. FIGS. 7, × 1, and 8, × 4, from Virginia material (no. 3725).

Although the varieties in their extremes are quite recognizable such a complex of transitional colonies occurs that many specimens can be placed only approximately. The achenes of the four varieties seem essentially identical.

CYPERUS FILICULMIS Vahl, var. **oblitus**, var. nov. (TAB. 343, FIGS. 1 et 2), spiculis brevibus 2–4-floris ut in var. *macilento*, sed umbellis valde evolutis radiis elongatis subaequilongis plerumque 5–15; bracteis involucri 5–7 elongatis quam radiis duplo vel usque quintuplo longioribus.—Sandy coastal plain, Maryland to Florida. TYPE: dry pine barrens, Cape Henry, Princess Anne Co., VIRGINIA, September 24, 1933, *Fernald & Griscom*, no. 2793 (in Gray Herb.; isotype in herb. Griscom).

Var. *oblitus* has usually been mistaken for *Cyperus echinatus* (Ell.) Wood, Class-book, 734 (1863)[1] or *C. Baldwinii* Torr. (1836), now passing as *C. globulosus* Aubl. (1775). We have not seen material from Cayenne, whence Aublet described his species, but *C. echinatus* (Ell.) Wood is well matched by West Indian material identified by Britton as *C. globulosus*. From *C. filiculmis*, var. *macilentus* Fern. the new var. *oblitus* differs in its nearly spherical and very full glomerules and in the greater development of the umbel. Var. *macilentus* (FIG. 3) ordinarily has a single terminal glomerule or 1 or 2 short and unequal rays subtended by 2–4 (rarely –5) relatively short bracts; it is widely distributed in the North, from central Maine and southwestern Quebec to Minnesota, south to the coast of Virginia and to Ohio, Indiana, Illinois and Missouri.

Typical *Cyperus filiculmis* of the Atlantic slope is technically a very difficult plant to classify, since it displays the fundamental characters of true *Cyperus* and, at the same time, the diagnostic character of *Mariscus* Gaertn. (1788), not Zinn (1757); *i. e.* the scales sometimes fall away from the rachis of the spikelet, as in *C. Schweinitzii* Torr. and *C. Houghtonii* Torr., or the whole spikelet is deciduous above the basal empty scales, as in *C. strigosus* L. Specimens with deciduous scales were described as *C. Bushii* Britton, Man. 1044 (1901), from the Great Plains States; but many individuals from Missouri or Oklahoma show mature spikelets disarticulating from the rachis

[1] Name not found in *Index Kewensis*.

(fig. 4). Similarly, on the Atlantic slope *C. filiculmis,* although theoretically with persistent scales, often loses them before the fall of the rachis of the spikelet (figs. 5 and 6). It seems impossible, therefore, to keep *C. Bushii* apart from *C. filiculmis* or the genus *Mariscus* Gaertn. apart from *Cyperus* L.

Extreme specimens of *Cyperus Schweinitzii* with unusually full inflorescences simulate *C. filiculmis,* as do some phases of *C. Houghtonii.* They may be separated by the following key:

Scales acuminate, 3.5–4.5 mm. long, the midrib excurrent as a mucro up to 1 mm. long: achenes 2.5–3.5 mm. long; culms scabrous. . . . . *C. Schweinitzii.*
Scales rounded at summit, the midrib scarcely or not at all excurrent: achenes at most 2.3 mm. long.
  Achenes short-ellipsoid, ⅔ as broad as long, 1–1.5 mm. broad. *C. Houghtonii.*
  Achenes slenderly oblong-trigonous (as in *C. Schweinitzii*), more than twice as long as broad, less than 1 mm. wide. . . . . *C. filiculmis.*

In the Southeast *Cyperus filiculmis,* var. *oblitus* is easily confused with *C. globulosus* Aubl.; in fact most of the material of this variety has been erroneously distributed as the latter species, due to the inadequacy of current keys. In *C. globulosus* the bases lack the great development of hard corms which mark *C. filiculmis.* The spikelets of *C. globulosus* are slender-pointed and the rachis is broadly winged as in *C. Grayii.* It seems to us that *C. subuniflorus* Britton in Small, Fl. Se. U. S. 173, 1327 (1903), based on *C. uniflorus,* var. *pumilus* Britton, Bull. Torr. Bot. Cl. xi. 87 (1884)[1] is merely small individuals of *C. globulosus.* Several sheets in the Gray Herbarium show both collected as one. We are, likewise, unable to keep out of *C. globulosus* the tropical *C. panamensis* (Clarke) Britton (1925), based on *Mariscus panamensis* Clarke, Kew. Bull. Add. Ser. viii. 15 (1908).

Psilocarya scirpoides Torr., var. **Grimesii,** var. nov. (tab. 344, figs. 1 et 2), formae typicae simillima, major; spiculis lanceolato-cylindricis, lateralibus longius pedicellatis; squamis late lanceolato-acuminatis; bracteolis chartaceis vix herbaceis plerumque enervosis.—

[1] In elevating to specific rank as *C. subuniflorus,* ascribed to Britton, a variety previously published by Britton, Dr. Small cited as its type merely "*Cyperus uniformis* var. *pumilus* Britton, not *C. pumilus* L.," without taking the trouble, comparatively slight for him at the time (and surely intended by the rule for transference or alteration of names which justly requires "the citation of a previously and effectively published description of the group under another name") to record the place and time of publication of *C.* "*uniformis*" var. *pumilus.* After considerable time-consuming search we have found that Britton described a *C. uniflorus,* var. *pumilus,* which, it is assumed, was what Small meant. It would be quite justifiable to ignore transfers or renamings based upon wholly inadequate citations. Many such transfers are now recognized wholly through courtesy.

VIRGINIA: edge of Lake Drummond, Dismal Swamp, October 2, 1921, *E. J. Grimes*, no. 4534 (TYPE in Gray Herb.), distributed and reported as *P. corymbifera* (C. Wright) Benth. by Grimes, RHODORA, xxiv. 148 (1922); pool in sandy barrens, Cape Henry, September 23, 1933, *Fernald & Griscom*, no. 2770.

Typical *Psilocarya scirpoides* (FIGS. 3 and 4) of southern New England (originally described from northeastern Rhode Island) has the nearly sessile spikelets blunter and more ellipsoid-ovoid, with slightly shorter, broader and less attenuate scales, its bracteoles herbaceous and strongly veined, with prominent green midrib. The achenes (FIG. 4) show no appreciable difference from those of var. *Grimesii* (FIG. 2). The more slender and mostly darker spikelets on longer pedicels were conspicuous in the field and the Virginia material is much larger than that of New England (and the Lake Michigan region); it thus strongly simulates *P. corymbifera* (C. Wright) Benth. of Cuba and Florida, for which the Grimes material was mistaken. The characteristic inflorescences of typical *P. scirpoides* (FIG. 3) and of var. *Grimesii* (FIG. 1) and achenes of both, as well as of the type of *P. corymbifera* (FIG. 6), are shown in PLATE 344.

The plant of Sussex Co., Delaware (wet soil, Baltimore Hundred, September 10, 1870, *Commons*), erroneously distributed as *P. nitens* (Vahl) Wood (FIG. 5), is slightly transitional but nearer the typical form of *P. scirpoides*.

ELEOCHARIS FLACCIDA (Reichenb.) Urban, var. **olivacea** (Torr.), comb. nov. *E. olivacea* Torr. Ann. Lyc. N. Y. iii. 300 (1836).

Collections made by ourselves, and other in 1934 by Fernald & Long, show that the characters (color of achene and length of bristles) relied upon to separate *E. olivacea* from the tropical and southern *E. flaccida* break down. The color of scales, likewise, is inconstant, though generally good. Specimens from tropical South America of typical *E. flaccida* sometimes have the bristles as long as in typical *E. olivacea* and the size and shape both of the tubercle and the achene shows too much inconstancy. *E. flaccida* in the South is chiefly in brackish habitats. North of southern New Jersey it is very local, chiefly in tidal estuaries: CONNECTICUT: border of marsh near New Haven, October 6, 1878, *J. A. Allen;* muddy shore, head of Hamburg Cove and muddy shore of Selden's Creek, Lyme, September 10 and 12, 1902, *Graves*. MAINE: Brunswick, August 6, 1894, *C. A. Davis;* tidal mud-flats of Cathance River, Bowdoinham, *Fernald & Long*, no. 12,783.

The best distinctions between the two varieties are the following.

E. flaccida (typical): Spikelets 2–6 mm. long; scales appressed, whitish-green to brown, the lowest 1.5–2.5 mm. long; tubercle with conic center 0.1–0.2 mm. high; bristles reaching to or overtopping achene.—Damp sands and sloughs, Florida to Texas, north on coast to tidal estuaries of New England; Yellowstone Park, Wyoming; Tropical America.

Var. olivacea. Spikelets 4–9 mm. long, more loosely flowered; scales loosely ascending, usually with brown or reddish sides, the lowest 2.3–2.8 mm. long; achenes with slightly prolonged base; tubercle with conic-subulate center 0.2–0.3 mm. high; bristles more often overtopping achene.—Wet sands and peats, Maryland to Nova Scotia; locally inland on wet peat, from Maine to southern Ontario and Minnesota, south to Pennsylvania, Ohio and Michigan.

Eleocharis obtusa (Willd.) Schultes, var. jejuna Fern. Virginia: wet marsh near North Landing River, Pungo Ferry, Princess Anne Co., *Fernald & Griscom*, no. 2777.

Var. *jejuna*, as recognized by Svenson in his revision, Rhodora, xxxi. 216 (1929), is not recorded from south of New England.

Scleria triglomerata Michx., var. gracilis Britton. Virginia: dry oak woods, Cape Henry, *Fernald & Griscom*, no. 2771.

Var. *gracilis* is a well marked extreme, apparently confined to the Coastal Plain, whereas the coarse typical form of the species has a wide continental range. Dr. Britton originally cited var. *gracilis* only from New Jersey, but it is now known from Long Island and from Virginia (see above), North Carolina (Wilson, Wilson Co., *Randolph*, no. 738) and Mississippi (Biloxi, *Tracy*, no. 4805).

Juncus biflorus Ell. Sk. Bot. S. Car. and Ga. i. 407 (1817). *J. marginatus* β. ? *odoratus* Torr. Fl. N. and Mid. U. S. 362 (1824). *J. heteranthos* Nutt. Trans. Am. Phil. Soc. n. s. v. 153 (1837). *J. odoratus* (Torr.) Steud. Syn. Pl. Glum. ii. 304 (1855). *J. marginatus* var. β. *biflorus* (Ell.) Wood, Class Bk., issue of 1861: 725; Engelm. Trans. St. Louis Acad. ii. 455 (1868) and in Gray, Man. ed. 5: 539 (1867); Buchenau, Engl. Bot. Jahrb. xii. 421 (1890). *J. marginatus aristulatus* Coville Proc. Biol. Soc. Wash. viii. 123 (1893) and later authors, as to plant, not as to type, *J. aristulatus* Michx. Fl. Bor.-Am. i. 193 (1803). *J. aristulatus* Bickn. Rhodora, vi. 174 (1904) and later authors, as to plant, not as to type.

In 1903 the senior author, examining the type of *Juncus aristulatus* Michx., made the memorandum: "small *J. marginatus*, with blunt petals and sharp sepals." Again, with Mr. Bayard Long, he re-examined the type in 1930 and they made a similar memorandum: "One bit of ordinary *J. marginatus* and 3 inflorescences 3–4.5 cm. long by 1–3 cm. broad, with erect branches and remotish 2–3-flowered glomerules; culms capillary, as slender as in small *J. macer*." Thus Michaux's type well agrees with his original description of *J. ari-*

Photo. *E. C. Ogden.*

Cyperus filiculmis, var. oblitus: fig. 1, umbel, × 1, from Virginia (type); fig. 2, glomerule, × 1, from type.
C. filiculmis, var. macilentus: fig. 3, umbel, × 1, from Maine (type).
C. filiculmis (typical); ripe glomerules, × 2: fig. 4, from Oklahoma (*C. Bushii*); fig. 5, from Massachusetts; fig. 6, from North Carolina.

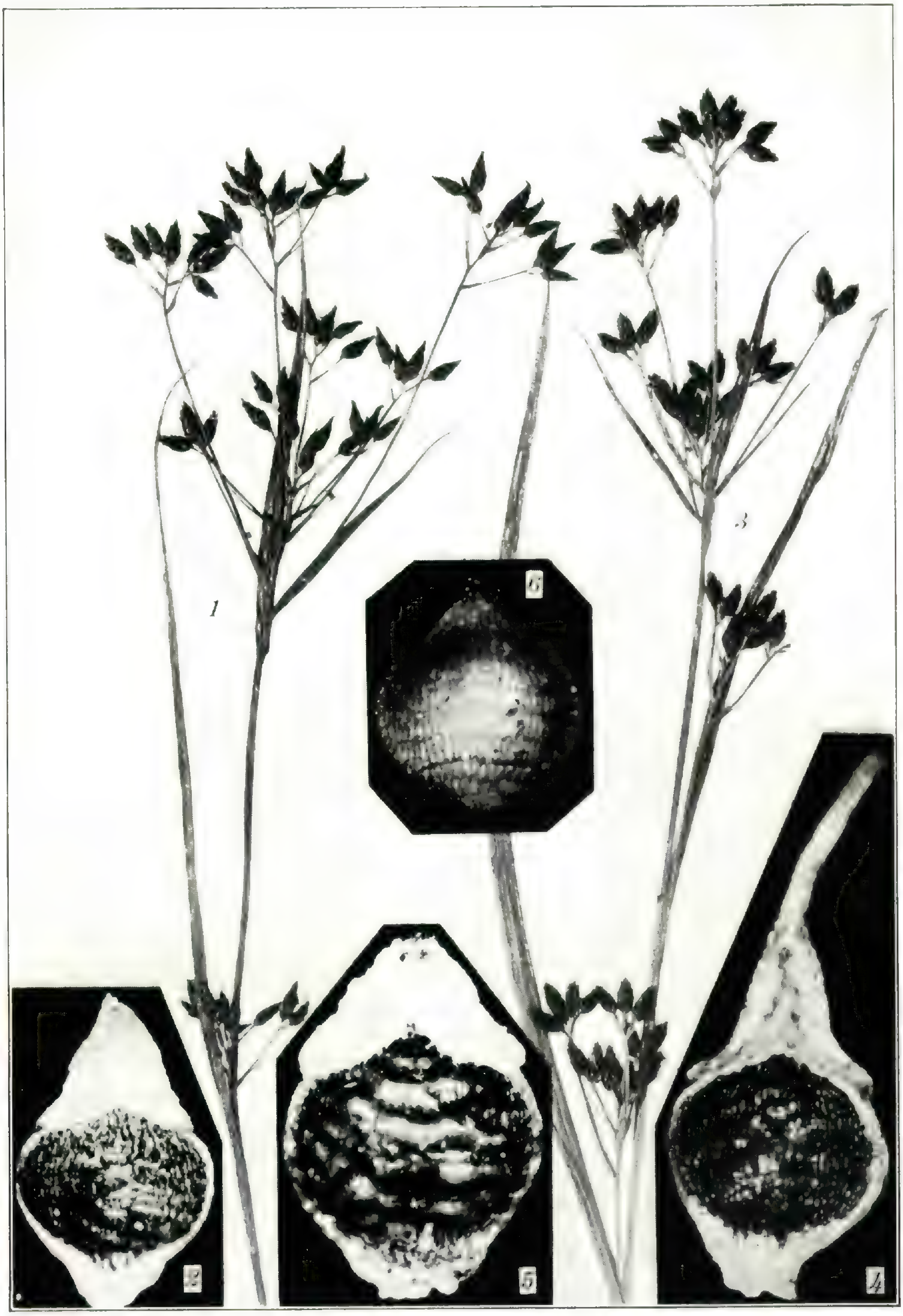

Photo. *E. C. Ogden.*

Psilocarya, inflorescences, × 1; achenes, × 35.
P. scirpoides: figs. 3 and 4, from Massachusetts.
P. scirpoides, var. Grimesii: fig. 1, from Cape Henry, Virginia; fig. 2, from Dismal Swamp, Virginia (type).
P. nitens: fig. 5, from South Carolina.
P. corymbifera: fig. 6, from Cuba (type).

stulatus, of which he said "Habitus *J. bulbosi*." Several recent collections from eastern North and South Carolina and Georgia agree with Michaux's material and are clearly depauperate *J. marginatus*.

The coarse plant with elongate and nodulose rhizome and solitary culms which has been recently passing as *J. aristulatus* is *J. biflorus* Ell. Most of the southern material has very open inflorescences with remote (1–) 2–3 (–6)-flowered glomerules; while many of the northern and some of the southern specimens have a compact inflorescence and approximate glomerules of 3–6 flowers While these extremes seem to have no definite geographic localization, loose inflorescences sometimes occurring in the North and dense ones in the South, they are readily recognizable at a glance. Indeed it is surpising that two such striking extremes have no trenchant technical characters, and the situation recalls that in *Juncus macer*. We consequently propose the plant with dense inflorescences as a form, rather than a geographic variety.

Juncus biflorus Ell., forma **adinus**, forma nova, inflorescentiis congestis, glomerulis approximatis.—Type: dry upper sandy and peaty beach of Saul's Pond, Brewster, Massachusetts, September 7, 1919, *Fernald* in Plant. Exsicc. Gray. no. 350 (in Gray Herb.).

(*To be continued.*)

POLLINATION OF THE ERICACEAE: CHAMAEDAPHNE AND XOLISMA[1]

John H. Lovell and Harvey B. Lovell

Chamaedaphne calyculata Moench

The leather-leaf, *Chamaedaphne calyculata* Moench, is a low shrub, 2 to 4 feet tall, with slender branches, growing in wet meadows, and bearing coriaceous evergreen leaves which are scurfy beneath. The flower-buds are formed the previous season and open during the following spring from April 20th to May 29th.

The flowers are nodding, 5½ mm. in length, solitary in the axils of the small upper leaves of the terminal racemes, which consist of 10 to 15 flowers. The white corolla is oblong, urn-shaped, narrowing at the apex, with five recurved teeth.

Stamens ten, included in the corolla, filaments white, anthers reddish-brown, awnless, terminating in elongated tubes and opening

[1] Published with aid to Rhodora from the National Academy of Sciences.

by terminal pores. Each anther-tube is tipped by a triangular process. When the proboscis of a bee is inserted into a newly opened flower, it strikes against one of these processes, causing the powdery pollen to fall out of the opening of the corolla on the bee's head. Since the bee inserts only its proboscis into the corolla, should it later visit a flower

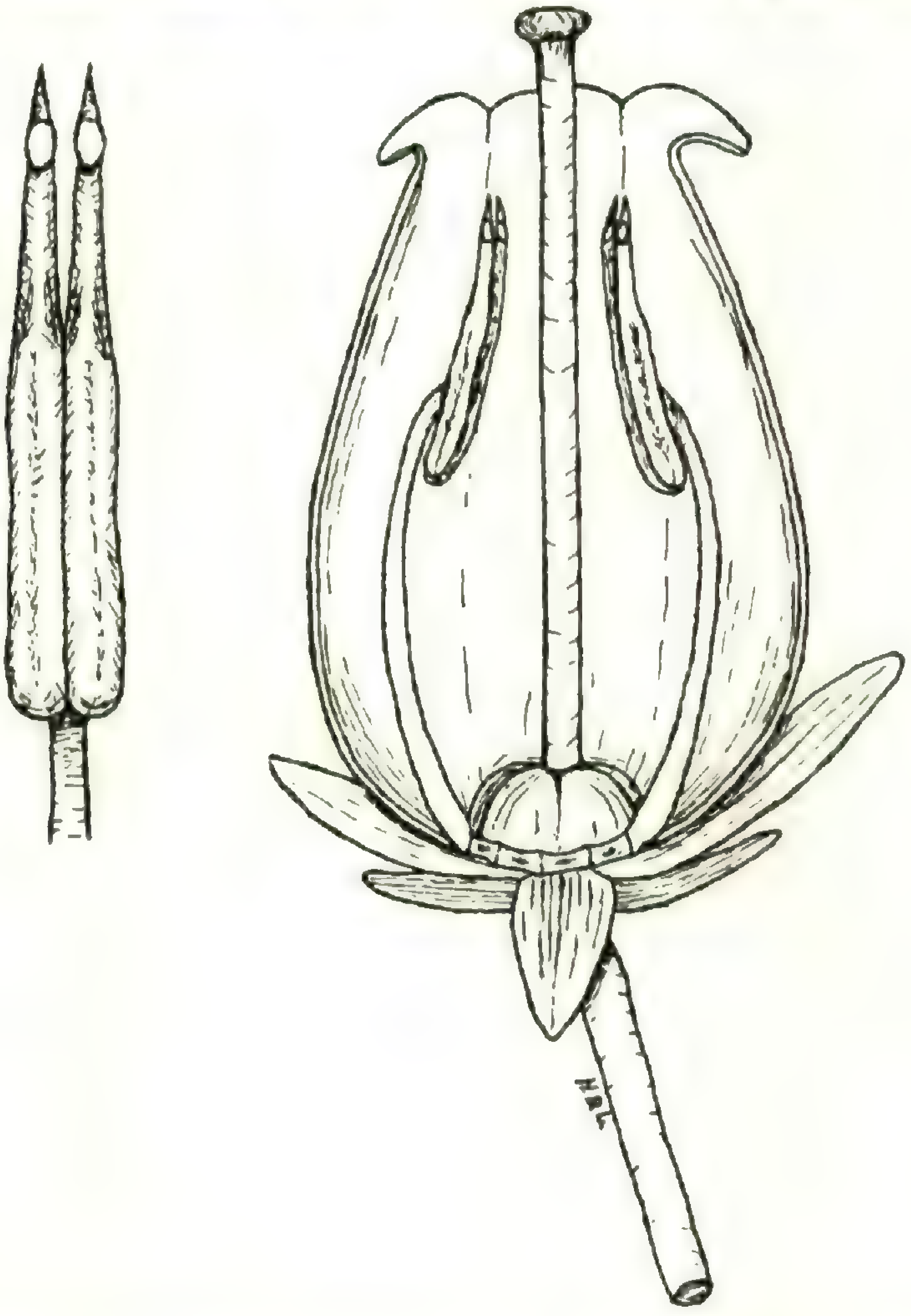

Fig. 1. Chamaedaphne calyculata: *a*, longitudinal section of mature flower, × 10; *b*, stamen, × 20.

with the stigma protruding, its head is certain to come in contact with it and ensure cross-pollination. Pollen white. Nectar is found sparingly between the corolla and the base of the stamens, but it is probably secreted on the disc and escapes between the filaments to the wall of the corolla.

In the bud the style is about the same length as the stamens, with a capitate pink stigma, which later becomes brown. After dehiscence the style increases in length until the stigma protrudes in mature flowers about one millimeter. If pollen falls from the anthers while

the stigma is in the mouth of the corolla, self-pollination will take place.

The following insects were taken on the flowers, all seeking nectar:

APOIDEA: Apis mellifica L. ☿; Bombus vagans Sm. ♀ ☿; B. ternarius Say ♀; B. sp. ♀; Macropis ciliata Patt. ♀; Nomada bella Cr. ♀ ♂; N. subrutila Lovell & Ckll. ♀ ♂; Andrena vicina Sm. ♀ ♂; A. weedi Vier. ♀; A. cressonii Robt. ♀.
BUTTERFLIES: Lycaena pseudagiolus Boisd. & Lec.
DIPTERA: Bombilius sp.

Chamaedaphne in this locality blooms while the weather is cold and stormy and is not frequently visited by insects. The above list of species is the result of many and long continued observations. Though there was an apiary not far away only one honey-bee was seen seeking nectar. The visits of the bumblebees were few and very brief—one species was not captured. Andrenid and Nomadine bees were the most frequent visitors. A bee-fly flew to a few flowers but escaped capture. The supply of pollen was meager, and not many seed capsules developed.

Xolisma ligustrina Britt.

Privet Andromeda, *Xolisma ligustrina* Britt., is a small, deciduous-leaved shrub, seldom more than 8 or 9 feet tall, usually growing in damp or wet land but also found in dryer soil at Waldoboro. The dry panicles of seed capsules of the previous season still remain on the branches, when it blooms again in July. The nearly globose white flowers are in terminal panicled racemes, which are many-flowered and leafless. The corolla is constricted at the mouth, with five recurved teeth.

The ten stamens are included in the corolla and are adherent to its base. The filament is flat with the upper portion curved into a U-shaped bow, which acts as a spring to hold the anther-pore against the style, preventing the escape of the pollen from the pendulous flowers. The anthers are brown, and attached to the filaments near their bases, opening by large terminal pores which are directed inward. In buds about to open, the anthers were mature, the pores open, and when the filaments were bent outward and allowed to spring back, the pollen was discharged. The yellow pollen grains are in tetrads.

The green, thick style is about two millimeters long with a small rounded stigma, which appeared to be in a receptive condition in newly opened flowers. The stigma stands slightly in advance of the

mouth of the corolla, rendering the opening so small that bees visiting the flower can not fail to come in contact with it.

According to Knuth[1] the flowers of the closely related genus Andromeda are homogamous. In *X. ligustrina* several panicles, which while in bud were covered with fine netting to exclude all insects, produced many seed capsules, though not as many as clusters of flowers which

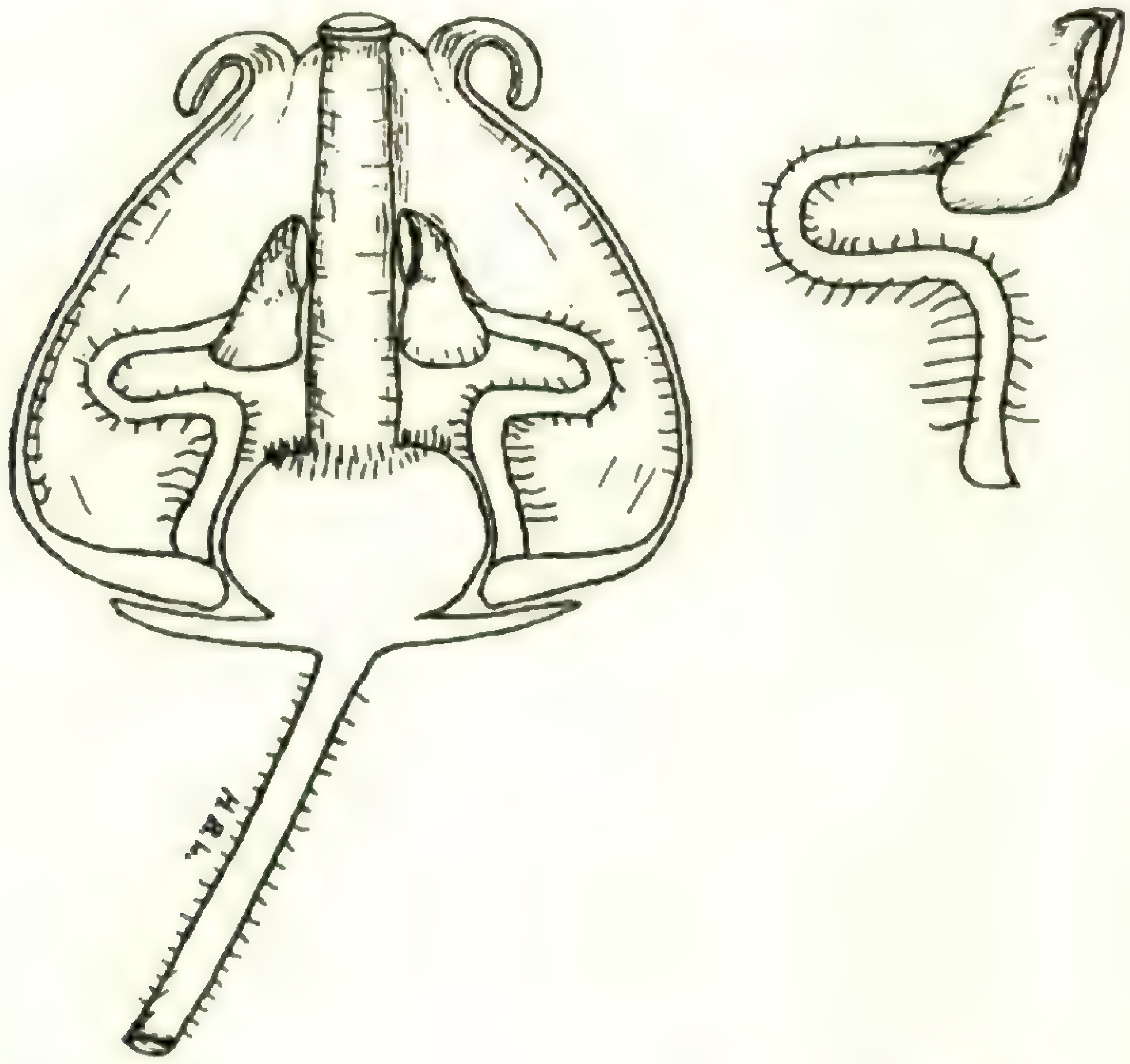

Fig. 2. Xolisma ligustrina: *a*, longitudinal section of flower, × 10; *b*, stamen, showing bow in filament, × 15.

had not been covered. This species is evidently capable of self-fertilization.

Nectar is apparently secreted by a rim of glandular tissue at the base of the corolla, where it accumulates in considerable quantity. The inside of the corolla and the filaments are covered with hair, which protects the nectar.

Bumblebees were repeatedly observed sucking nectar, their tongues passing at first between the bowed filaments; but later, as the bees turned half or three-fourths of the way around the flower, their tongues passed outside of the filaments. The tongue could be clearly seen through the translucent corolla.

While bumblebees were rather rare on the bloom of the Privet Andromeda, observation of a large bush for two hours showed that

[1]Knuth. Blütenbiologie, II, pt. 2, p. 37.

all the flowers probably receive several visits during anthesis. *Bombus ternarius* especially was quite abundant, and one specimen was seen to make sixteen visits in one minute.

The flowers are pollinated almost exclusively by bumblebees, though they were not very frequent visitors in the open woodland, where our observations were made. Only a single specimen of the honey-bee, of the Eristalis fly, and of the female of Augochlora were collected. The crab-spider *Misumena vatia* was present in a few flower clusters, and in one instance had captured a worker of *Bombus vagans*.

The following visitors were collected between July 9th and 19th:

APOIDEA: Psithyrus laboriosus Fabr. ♀ ♂; Bombus vagans Sm. ♀; B. terricola Kirby ♀; B. ternarius Say ♀; Augochlora confusa Rob. ♀.

DIPTERA: Eristalis flavipes Walk.

Waldoboro, Maine.

Lepidium latofolium in Connecticut.—*Lepidium latifolium* L. is sure to interest any observer on first acquaintance. It is a coarse, somewhat woody plant, 1–1.5 m. or rarely 2 m. tall, with pallid, glaucous stems leafless below at flowering time and a large, stiff panicle. Its multitude of fine white flowers in small corymbs terminating the branchlets soon give way to maturing fruit and an unsightly bare appearance. An extensive underground root-system makes it a bad weed in cultivated land.

In Europe its natural habitat seems to be salt marshes and seashores. In such situations it was my good fortune, on July 5, 1934, to find great quantities of the plant, beautifully in flower, in Stamford and Darien, Connecticut, from Cove Island intermittently along the salt shores of Holly Pond, or in some areas in solid ranks for long distances, to the outer reaches of Noroton Bay on Pratt's Island, where it clung tenaciously to wave-washed clefts in exposed ledges.

Extensive salt marshes in Darien have long been reclaimed by gravel "fill" from the Bay; on some of these areas near the shore are many colonies or broad expanses of the plant. It also grows in some fields, roadsides and even in a privet hedge, all well beyond the influence of salt water.

While in flower it is very conspicuous as far as the shores are visible, along a total shore-line of more than three miles.

Mr. Ludlow Griscom at a later date independently observed an

acre of it back of Noroton Beach in the area described. It has been recorded by Albert P. Morse[1] at an inland station in Peabody, Massachusetts, where it was first collected by Mr. R. B. Mackintosh.

The source of the plant in Connecticut may reasonably have been a dye and licorice works in operation on Cove Island for 110 years up to 1914. Ship-loads of crude materials were brought from foreign ports. *Paulownia tomentosa* (Thunb.) Steud. was so introduced near the mills and was once a nuisance, but now persists only as one small tree, half killed during the winter of 1933–34, and a few young plants better protected in a waste of old bricks. A colony of *Lepidium Draba* L. on the shore is conspicuous in its season.

On a half-acre of shallow "fill" over an area of salt marsh in Darien are six or seven clumps 2.5–3.5 m. tall of *Tamarix pentandra* Pall. which may have been introduced in the same way.—Edwin H. Eames, Bridgeport, Connecticut.

Two New Botanical Journals.—Two new journals printed, one by the offset process, the second mimeographed, are welcome evidence of the growing mediums for scientific record. The first, Phytologia,[2] is a cooperative enterprise, "financed entirely by its contributors, each one paying, in advance, for the entire cost of printing," each share-holder "sharing in the profits, if any accrue." The cost to subscribers is determined by the actual expense of publication; if the subscription list becomes large enough the price will be reduced or the size increased. Articles dealing with or resulting from original research in all fields of botany, as well as biographical sketches and critical reviews will be considered for publication; floristic lists, popular articles, casual notes and polemics will not be printed. The field of Phytologia is, thus, purely technical. The first number (December. 1933) consists entirely of diagnoses of new species and critical notes on others of tropical America. The second number (July, 1934) is devoted chiefly to similar papers on tropical American plants, but with one on Pollinia, and one on the Mahonias of the Pacific States. For its purpose Phytologia promises to be very useful, particularly as it insures more prompt publication than is possible in the longer-established journals which still hold to the dignity of appearing in conventional print and which, at least in the case of Rhodora, are pressed by authors for more space and prompter publication than can always be supplied. The difference between publishing without individual expense in the established and somewhat subsidized journals and paying the cost of publication in Phytologia is, consequently, partly offset by greater promptness. As to cost to contributors: "the basic rate for a page or fraction thereof is $1.65." At this rate it may become cheaper to print the journal in conventional form (the cover-pages of no. 2 *are* thus printed), an improvement which will be appreciated by the contributing share-

[1] Rhodora 26: 197. 1924.

[2] *Phytologia.* Published by H. A. Gleason and Harold N. Moldenka. The New York Botanical Garden, Bronx Park, New York, N. Y. $5.00 in advance.

holders. As a journal "Designed to expedite botanical publication" Phytologia is heartily welcomed.

The second new journal, CLAYTONIA,[1] most appropriately named for the pioneer botanist of Virginia, John Clayton, is an outgrowth of the very live activity of the Virginia Academy of Science. The first number (June, 1934) is 10 pages, in mimeograph, giving editorial statement of the origin of the new publication, a brief sketch of John Clayton, a history of the recent efforts of the Academy to coordinate the work on the flora of Virginia and eventually to prepare an authoritative state flora. Following these statements of policy are brief articles on the rarity in Virginia of *Iris virginica, Pogonia affinis* and *Parnassia asarifolia;* a section of "Queries and Answers" and another on "New Plants." With a strong appeal to the amateur and the nature-lover and acknowledged support from local garden clubs, Claytonia is bound to have a wide usefulness. The work it has undertaken will well repay the effort. May it be wisely guided and richly fruitful.—M. L. F.

A FLORA OF THE NIAGARA FRONTIER.[2]—It is indeed a pleasure to welcome an addition to the small, though slowly increasing, number of American local floras which can properly be called models of their kind. Such an addition is Mr. C. A. Zenkert's "Flora of the Niagara Frontier Region"—an area approximately that of a circle with a fifty-mile radius and the city of Buffalo as its center. The author has packed into his 300-page volume every feature which a work of its nature ought to have, and all show every evidence of care, throughness and competence in execution. The only flaw which has caught the reviewer's eye is that the date of General Sullivan's expedition against the Iroquois is given as 1799 when it should be 1779!

Especial mention should be made of the excellence of Mr. Zenkert's analysis of the effects of the activities of man on the vegetation and of the numerous illustrations of single species, topographic features and ecological groups. For the most part these are skilfully photographed and unusually well printed. The picture of water-lilies on page 307 is not only an ecological study, but a work of art.

The back-bone of any local flora is its systematic list of species. Mr. Zenkert's shows the same high quality as does the rest of his work and is enriched with discriminating comment. It exhibits two interesting innovations. English names which assign a plant to a botanically wrong genus, such as "red cedar" for a species which is really a juniper, are placed within quotation marks, to call attention to the mistaken generic ascription. Two sets of terms are used to express frequency of occurrence—one, "rare" "common" etc. for what may be designated geographic frequency over the entire area of the flora ("distribution in space" Mr. Zenkert calls it); the other, "solitary," "abundant," "dominant," etc., for the relative number of individuals in a given habitat ("density in place" is Mr. Zenkert's phrase). Very possibly this system

[1] *Claytonia.* Published by the Committee on State Flora, of the Virginia Academy of Science at Lynchburg, Virginia. DR. IVEY F. LEWIS, *Chairman of Committee*, University of Virginia, Charlottesville, RUSKIN S. FREER, *Editor*, Lynchburg College, Lynchburg.

[2] The Flora of the Niagara Frontier Region. Bulletin of the Buffalo Society of Natural Sciences, vol. xvi. 1934. pp. x–328. Map and ill. $2.00.

can be improved upon; but there is no doubt that it tends toward greater accuracy and completeness of statement.

The nomenclature of the list follows that of the seventh edition of Gray's Manual, with "such emendations as have been published since in *Rhodora* and elsewhere." Nobody, perhaps, can be expected to keep wholly abreast of nomenclatural change; and the unnatural vitality of error has often been pointed out. So I find an old mistake of my own staring me in the face, in the ascription of the combination *Thelypteris spinulosa*, var. *intermedia* to me and not to its real author, Nieuwland. And two mistakes of Gray's Manual, *Botrychium obliquum* for the specific name, and *dissectum* for the variety under it (although Clute had long ago pointed out that *dissectum* was the earlier name) and *Eriocaulon articulatum* for the correct *E. septangulare* are propagated for one more bibliographic generation. But Mr. Zenkert's record is on the whole enviably good; in all respects he is to be congratulated on a thoroughly commendable and useful work.—C. A. Weatherby, Gray Herbarium.

Two Western Plants on the Keweenaw Peninsula.—Potentilla Blaschkeana Turcz. On June 17, 1934, while on a fishing trip, I found a *Potentilla* that was new to me. It was not yet in flower; or rather the first flower of the season was just beginning to open. The plant reminded one of *P. argentea* but it was an erect plant with many stems. On July 2, it was in full bloom. It had a very woody root with a many-headed crown. I split the root and took a part to plant in the garden where it flourished all the rest of the summer. It is the only plant I have seen but it evidently has been there for years, to judge from the size of the root. It keys into *P. Blaschkeana* of the Rocky Mountain region. No. 9723, June 17 & July 2, 1934.

Rosa Lunellii Greene. While taking a constitutional on Sunday morning, July 15, 1934, I found a rose on the shores of Torch Lake at Hubbell that was entirely unfamiliar to me. It keys into *Rosa Lunellii* Greene, a species of the Dakotahs. There were two or three clumps of it, perhaps all from the same underground system. No. 9934, July 15 & Aug. 12, 1934.—Oliver A. Farwell, Lake Linden, Michigan.

Volume 37, no. 435, including pages 77–128 and plates 327–331, was issued 9 March, 1935.

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Rhodora

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JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 37. May, 1935. No. 437.

THE PLANT CONTENTS OF TWO MOUSE STOREHOUSES[1]

FRIEDA COBB BLANCHARD

WHILE turning sticks and logs in search of salamanders, the writer has twice in this vicinity uncovered the autumn storehouse of a mouse. Both of these stores were in damp, unpastured oak woods—the kind of woods in which salamanders and frogs abound.

I cannot say with certainty to what species of mouse these caches belonged. From the type of habitat it is fair to assume that they belonged to the deer mouse *Peromyscus leucopus noveboracensis*. The literature, however, assigns the type of stored food to Microtus. In hunting salamanders we not infrequently uncover a nest of Peromyscus, and have several times collected the partly grown young and raised them, making identification certain; but we have never found a nest of any other species in this type of woods.

The first storehouse was found in an oak woods in Freedom Township, Washtenaw County, about 15 miles from Ann Arbor, on November 19, 1922. This storehouse contained about one pint of tubers, rhizomes and seeds, mainly of three kinds, and two or three hickory nuts. Most of the material was saved for feeding some wild mice that were being kept in cages but a small amount was planted in the greenhouse for identification.

The bulk of the store was composed of the spindle-shaped, yellow tubers of the pepper-root, *Dentaria laciniata* Muhl. The species was determined later from the growing plants. Among the pepper-roots were numerous rootstocks of a violet, determined as *Viola sororia* Willd., and some "hog peanuts," the large, flattened, underground

[1] Paper from the Department of Botany of the University of Michigan, No. 523.

pods of *Amphicarpa monoica* (L.) Ell. Though they were not noticed before planting, there must have been present some tubers of the spring beauty, *Claytonia virginica* L., for this species came up in the flats. These tubers are very similar in size and color to the underground seed pods of Amphicarpa, and probably escaped notice among them.

The second storehouse was found under a log in an oak woods of White Oak Township, Ingham County, about 35 miles from Ann Arbor, on November 10, 1929. Like the first storehouse, this one contained about a pint of material. In addition to the rhizomes and underground seeds there were a few pieces of acorns (which may have been accidentally collected in scooping up the contents of the store) and about 60 pieces of stem, one to three inches long, apparently from the runners of some plant, perhaps a violet.

The rhizomes of a violet (species not determined) composed about half of the store. "Hog peanuts," the underground pods of *Amphicarpa monoica,* occupied about half as much space as the violets. The other quarter of the store consisted of five large rhizomes of *Geranium maculatum* L., 4 unidentified bulbs (that failed to grow), apparently liliaceous, and one single unidentified tuber of a different kind.

The two stores were alike in containing Viola and Amphicarpa in quantities. One had predominantly these two species, and lacked Dentaria; in the other, Dentaria far outbulked the other species. It is not known whether *Dentaria laciniata* is abundant in the woods where the nest lacking it was found.

University of Michigan, Ann Arbor.

A New Moss Flora, with biographical Sketch of the Author.[1]—For many years Father Dupret has been known as an enthusiastic bryologist. Since his death his many valuable notes have been collated and edited for publication by a younger associate of his in the Society of Saint-Sulpice, Father Alderic Beaulac. The result is a pamphlet of convenient size which ought to be of great help to moss students in eastern Canada and the northeastern United States as well.

The descriptions and appreciations of the different species show that Father Dupret knew and loved them as friends, as well as feeling a deep scientific interest in their characteristics. Thus he writes of *Grimmia Dupreti*, one of his discoveries, "Gathered at Oka, and a few neighboring places only, on the worn sandstones of the stone walls of this region. It

[1] Contributions du Laboratoire de Botanique de l'Université de Montréal, No. 25. *Études sur les Mousses de la région de Montréal.* Par H. Dupret. viii + 70 pages, 4 figures. 1934, $0.75.

is very difficult to detach from the rock: it is absolutely necessary to scratch it off with a knife. A very small plant. The capsules hardly reach beyond the top of the stem."

As a part of this interesting flora, Father Beaulac has written a most charming biographical sketch of Father Dupret. It is a beautiful picture of a refined man in the cloisters growing old serenely, because blessed with numerous friends and varied intellectual interests.—CLARENCE HINCKLEY KNOWLTON, Hingham, Massachusetts.

THREE DAYS OF BOTANIZING IN SOUTHEASTERN VIRGINIA

M. L. FERNALD AND LUDLOW GRISCOM

(*Continued from page 157*)

LAPORTEA CANADENSIS (L.) Gaudich. VIRGINIA: ditch at border of gum swamp south of North Landing, Norfolk Co., no. 2871.

Not represented in the Gray Herbarium from the coastal plain south of New York.

POLYGONUM ARIFOLIUM L., var. **lentiforme**, var. nov., a forma typica recedit achaeniis minoribus lenticularibusque vix gibbosis 3–3.5 mm. latis 2.2–2.6 mm. crassis.—Prince Edward Island to southern Ontario, south to New Jersey, Pennsylvania, Ohio and Michigan. TYPE: swamp along Great Brook, Southwick, MASSACHUSETTS, *F. C. Seymour*, no. 251 (in Gray Herb.).

The common *Polygonum arifolium* of southeastern Canada and the northeastern States has the achene very definitely smaller than in the more southeastern plant. All material in fruit from the District of Columbia southward has the achenes 4–4.2 mm. broad and 3–3.2 mm. thick, with noticeably more umbonate sides. In view of the original Linnean citation of the species as coming from "Virginia, Florida," the southern plant must stand as typical *P. arifolium*.

LESPEDEZA ACUTICARPA Mackenz. & Bush. VIRGINIA: dry border of gum swamp, Pungo Causeway, near Land of Promise, Princess Anne Co., no. 2838.

Our material is a close match for several sheets of the Missouri plant distributed by Bush. It is apparently the first from the Atlantic slope.

VARIATIONS OF RHUS COPALLINA.—The shrub and small tree of southeastern Virginia impressed us, as it did later Fernald and Long, by the numerous pairs of narrow leaflets, as contrasted with the fewer and broader leaflets of the northern and wide-ranging shrub. Linnaeus, in publishing the species, rested it upon earlier citations, one of them a specimen of Clayton's (no. 728, described by Gronovius),

the other a very conventionalized and barely recognizable figure of Plukenet's. The Clayton plant, having been definitely studied by Linnaeus, should be accepted as the type. Thanks to a life-sized tracing of the type, kindly supplied by Professor H. W. Rickett, who recently spent some time at the British Museum, we are now able to identify *R. copallina* as the small tree of the southeastern United States (south into Florida) with the lance-oblong leaflets definitely attenuate at base. This typical *R. copallina* extends locally along the coast to southeastern New York.

The more generally distributed variation, common from southern Maine to Michigan, southward into the upland of North Carolina and to Oklahoma, has the comparatively few leaflets more ovate-lanceolate or short-oblong and rounded at the base. This is var. *latifolia* Engler in DC. Mon. iv. 384 (1883).

In the Southwest, especially in Texas, the leaflets are lance-falcate, smaller and narrower than in typical *R. copallina.* This is var. *lanceolata* Gray, Journ. Bost. Soc. Nat. Hist. vi. 158 (1850).

In southern Florida the species is represented by var. *leucantha* (Jacq.) DC. Prod. ii. 68 (1825). This was based upon *R. leucantha* Jacq. Hort. Schoenb. iii. 50. t. 342 (1798). *R. leucantha* was a cultivated shrub of unknown origin. By Small it is restricted to the West Indies and the Everglade Keys of Florida. Apparently the only collection from the West Indies is *C. Wright,* no. 2290 from Cuba, first recorded by Grisebach as *R. copallina,* var. and cited by Engler (along with a Rugel specimen from Portsmouth, Virginia which is true *R. copallina*) as the basis of his *R. copallina,* var. *angustialata* Engler, l. c. Engler cited *R. leucantha* as a direct synonym of this variety. Wright's original field-label on the sheet in the Gray Herbarium states that it was CULTIVATED at Pinales Rangel, Sabanilla. Its source in Cuba is perhaps as vague as that of the Jacquin type.

Another variation in Florida, thence north to South Carolina is

Var. **obtusifolia** (Small), comb. nov. *Schmaltzia obtusifolia* Small, Fl. Se. U. S. 729 (1903). *R. obtusifolia* Small, Fl. Miami, 112 (1913).

THE VARIATIONS OF ROTALA RAMOSIOR (PLATE 345).—*Rotala ramosior* (L.) Koehne occurs in two very distinct varieties: one with small fruits and minute subulate bractlets, chiefly on sandy shores of the Atlantic coastal plain northward to Massachusetts, with remote areas on the sands of the Great Lakes and on the Pacific slope; the other, coarser throughout, with conspicuously larger fruits and elongate, linear-lanceolate bractlets. The latter occurs in rich low

grounds from the Hudson Valley to Iowa and southward; both varieties occurring in Virginia, the source of the Clayton type. *Ammania ramosior* L., upon which *R. ramosior* was based, rested wholly on the Clayton (Gronovian) plant, no. 774. This has been carefully compared by the junior author with characteristic specimens of the two extremes. The type is clearly a large plant of the coastal plain extreme, with the smaller leaves, and the abundant fruit never wider than in the largest of a characteristic Florida sheet and none quite as long. The larger, chiefly inland variety should, therefore, be called

Rotala ramosior (L.) Koehne, var. **interior** (tab. 345, figs. 1 et 2), planta robusta ad 4.5 dm. alta simplex vel plerumque ramosa, ramibus adscendentibus; foliis majoribus 5–10 mm. latis subsessilibus vel breve petiolatis; fructibus (3.2–) 3.8–4.4 mm. latis 3.5–5 mm. longis; bracteolis lineari-lanceolatis, 1.6–2.4 (–4) mm. longis.—Rich low ground, Hudson Valley, New York to Iowa, south to Florida, Louisiana and Oklahoma. Type: low wet grounds, Knox Co., Tennessee, July 21, 1890, *Albert Ruth*, no. 224 (in Gray Herb.).

Contrasted with var. *interior*, typical *Rotala ramosior* is distinguished as follows:

R. ramosior, var. **typica** (Pl. 345, fig. 4 and 3, transitional). *Ammania ramosior* L. Sp. Pl. 120 (1753). *A. ramosa* Hill, Veg. Syst. xi. 14 (1767). *A. humilis* Michx. Fl. Bor.-Am. i. 99 (1803). *A. auriculata* Raf. Atl. Journ. 146 (1832). *Boykinia humilis* Raf. Aut. Bot. 9 (1840). *A. occidentalis*, var. *pygmaea* Chapm. Fl. So. U. S. 134 (1860). *R. ramosior* (L.) Koehne in Mart. Fl. Bras. xiii.[2] 194 (1875). Plant low, simple to diffusely branched or depressed, rarely 2 dm. high: larger leaves 1.5–4 (–5) mm. broad, longer-petioled: fruit smaller, 2–3.3 mm. broad, 2–4 mm. long; bractlets subulate, 0.5–1.4 mm. long.—Sandy pond-shores, etc., coastal plain from Massachusetts to Florida and Texas; sands of southern Michigan, northern Indiana, Illinois and Minnesota; also Washington and Oregon.

Rafinesque, Aut. Bot. 39 (1840) gave names to "4 sp. or var. blended in *A. ramosa*" but his diagnoses, based merely on habit rather than more fundamental characters, are not clearly decipherable.

Rhexia in northeastern America (Plates 346 and 347).—In the area covered by Gray's Manual and Britton's Manual five species of *Rhexia* have been recognized: *R. virginica* L. (pl. 347, figs. 1–4, and pl. 346, fig. 5), widespread from Nova Scotia southward and westward; *R. mariana* L. (pl. 347, figs. 5 and 6, and pl. 346, fig. 7), from Florida north to southeastern Massachusetts, and reputed to grow in the interior; *R. interior* Pennell (pl. 346, fig. 6 and pl. 347, fig. 7), somewhat related to the two preceding; *R. aristosa* Britton (pl. 347, fig. 8), an exceedingly local species of the coastal plain from Georgia

to New Jersey; and *R. ciliosa* Michx., a characteristic species of the southern pine barrens, which in Torrey and Gray's Flora of North America (1840) was recorded with doubt from Delaware and which has lingered in our manuals since the first edition (1848) of Gray, as growing in Maryland. No material of the latter is in the Gray Herbarium from north of North Carolina and the species was not admitted by Shreve to the flora of Maryland. It should be dropped from northern floras until there is definite evidence of it north of the Carolinas.

Field experience in southeastern Virginia failed to reveal any *Rhexia aristosa;* but it was evident that the abundant material of *Rhexia* there could not be referred merely to the two Linnean species. In fact, we and, in 1934 Fernald and Long found no true *R. mariana* and the only *R. virginica* found was a very local area in 1934. The identification of our material has, therefore, led to a consideration of the entire genus. We are here presenting our conclusions regarding it within the "Manual range."

The subterranean habit is fundamental but all too rarely well displayed in herbarium specimens; the size and distribution of murications or processes on the seeds are apparently constant characters; so, too, is the relative length of the neck of the hypanthium. The two former characters are practically never mentioned in current treatments. Pubescence, breadth of leaf and color of flowers in our section of the genus are secondary.

The brilliantly reflecting or iridescent lustre of the seeds makes them difficult to bring out properly by photography. Consequently, Miss Ruth Peabody, of Radcliffe College, has kindly supplied us with drawings, × 50, of the seeds needed in clarifying the more northern species of the genus. The photographs show, besides the newly proposed species, the characteristic bases of *Rhexia virginica* (pl. 347, figs. 9–11), and of *R. mariana* (pl. 347, fig. 13), and, × 4, fruiting hypanthia of each of our species.

a. Leaves entire or only remotely serrate: calyx-lobes longer than neck of hypanthium; bristles of hypanthium not gland-tipped; petals aristate at apex: stem glabrous............1. *R. aristosa.*

a. Leaves regularly serrulate: calyx-lobes shorter than to about equaling neck of hypanthium; bristles of hypanthium (when present) gland-tipped: petals not aristate-tipped: stems often more or less pubescent....*b.*

b. Tuberous rooted, the bases not forming horizontal, subligneous runners: seeds 0.65–0.8 mm. long............2. *R. virginica.*

b. Non-tuberous, the bases consisting of tap-roots and horizontally spreading or creeping subligneous stolon-like stems: seeds 0.5–0.6 mm. long.

Neck of fruiting hypanthium longer than body: stems subterete, not obviously 4-angled.................3. *R. mariana.*
Neck of fruiting hypanthium as long as or shorter than body: stems 4-angled, especially above.
Mature hypanthium (excluding calyx-lobes) 7.5–10 mm. long, its body 4–5 mm. in diameter: seeds with low rounded pebbling, the surface appearing relatively uniform.................................4. *R. interior.*
Mature hypanthium 9–14 mm. long, its body 5.5–8 mm. in diameter: seeds with prominent thin ridges and slender papillae..........................5. *R. ventricosa.*

1. R. ARISTOSA Britton, Bull. Torr. Bot. Cl. xvii. 14, t. 99. (1890).—Very locally in pine barrens, New Jersey to Georgia. PLATE 347, FIG. 8.

2. R. VIRGINICA L. Sp. Pl. 346 (1753).—Georgia to Louisiana, north to Nova Scotia and locally inland to central and western New York, southern Ontario, Ohio, Indiana, Wisconsin and Missouri. Type studied by junior author. PLATE 347, FIGS. 1–4, PL. 346, FIG. 5.

In *Rhexia virginica* the hypanthium has the neck very much shorter than the body and the very papillose seeds are the largest in this section. The pubescence is very variable, some plants from as far north as Nova Scotia being as glabrous as the southern *R. stricta* Pursh, which has the seeds as small as in *R. mariana.* The base, when properly collected, is absolutely distinctive. PLATE 347, FIG. 1 shows a tuber, × 1, from a gravelly shore, FIG. 2 from moss, FIG. 3 from inundated peat.

3. R. MARIANA L. A somewhat polymorphic species, clearly distinguished among those with horizontally spreading subligneous bases (PLATE 347, FIG. 5), by its terete or subterete stems and the long necks of the fruiting hypanthiums. We recognize three varieties:

Var. **typica**. *R. mariana* L. Sp. Pl. i. 346 (1753). *R. mariana*, var. β. *rubella* Michx. Fl. Bor.-Am. i. 221 (1803).—Leaves lanceolate to elliptic, subglabrous to hirsute: petals pale-rose to whitish, 1.2–2 cm. long; seeds rather sharply muriculate.—Florida, northward on the coastal plain to Cape Cod, Massachusetts. Type examined by junior author. PLATE 346, FIG. 7.

Var. PURPUREA Michx. Fl. Bor.-Am. i. 221 (1803). *R. Nashii* Small, Fl. Se. U. S. 824, 1335 (1903).—Rather coarser throughout: leaves lanceolate, more generally villous-hirsute: petals deep-rose-color or purple, 1.5–2.5 cm. long: seeds with conspicuous pebbling.—Louisiana to Florida, north on the coastal plain to southeastern VIRGINIA: about Franklin, Southampton Co., *Heller*, no. 1115; Northwest, Norfolk Co., *Heller*, no. 727; wet peaty clearings in woods of *Pinus serotina*, south of Grassfield, Norfolk Co., *Fernald & Long*, no. 4065; shallow pools and wet peaty depressions in pineland, Cape Henry, *Fernald & Griscom*, no. 2859, *Fernald & Long* no. 4061; inundated swales back of dunes, south of False Cape, Princess Anne Co., *Fernald & Long*, no. 4067. PLATE 346, FIGS. 5 and 6.

Var. **leiosperma**, var. nov. (TAB. 346, FIG. 8), a var. *typica* recedit seminibus obsolete muriculatis, papillis depressis.—Louisiana and

Texas northward to Missouri, southern Illinois and southern Indiana. The following are referred here. Indiana: sandy soil 2 miles west of Grand View, Spencer County, *Deam*, no. 16,654. Illinois: wet grassy places, Metropolis, August 16, 1902, *Gleason*. Kentucky: Monkey's Eyebrow, Ballard Co., August 14, 1928, *W. A. Anderson*. Tennessee: open grassy swamp, Hollow Rock Junction, Carroll Co., *Svenson*, no. 419; gravelly oak woods, 6 miles east of Crossville, alt. 2300 feet, *Svenson*, no. 4146. Missouri: Dunklin Co. *Bush*, no. 42. Arkansas: Pulaski Heights, Little Rock, *Demaree*, no. 8128; Little Rock, June 21, 1885, *W. H. Manning*. Louisiana: meadows, near Alexandria, *Ball*, no. 618. Texas: Houston, May, 1883, *Lindheimer;* eastern Texas, *E. Hall*, no. 198; damp sandy soil, Montgomery Co., July 18–21, 1909, *R. A. Dixon*, no. 487 (type in Gray Herb.); near Texarkana, Barrie Co., *Heller & Heller*, no. 4143.

Var. *leiosperma* has a range covering that of *Rhexia interior*. The latter species, however, has quadrangular stems, broader, round-based and essentially sessile leaves suggesting those of *R. virginica*, short neck of hypanthium and coarser seeds with more obvious pebbling.

4. R. interior Pennell, Bull. Torr. Bot. Cl. xl. 480 (1918), renaming of *R. latifolia* Bush, Rhodora xiii. 167 (1911), not Aubl. (1775).—Pond-shores, wet ground and prairies, Missouri. Plate 346, fig. 6, and pl. 347, fig. 7.

5. R. **ventricosa**, n. sp. (tab. 346, figs. 1–4), planta etuberifera, radice verticaliter descendente caulibus subligniis stoloniformibusque horizontaliter reptantibus; caulibus floriferis quadrangulatis 2.5–8 dm. altis plus minusve hispidis laxe ramosis ramis adscendentibus; foliis elliptico-lanceolatis vel anguste oblongo-ovatis sessilibus vel subsessilibus 2–6 cm. longis 0.7–2.3 cm. latis valde 3-costatis hispidis; hypanthiis plus minusve glanduloso-setosis maturis 9–14 mm. longis, basi ventricosis 5.5–8 mm. diametro in collum subaequantium producto; lobis calycis deltoideo-lanceolatis 2–3 mm. longis divergentibus; petalis purpureis 1.5–2 cm. longis; antheris flavis 8–9 mm. longis angustis basi appendiculatis, appendiculis 1–2 mm. longis; seminibus cochleiformibus 0.5–0.6 mm. longis longitudinaliter angusteque costatis, costis valde papillosis, papillis angustis subremotis.—Southeastern Virginia and eastern North Carolina. Virginia: vicinity of Norfolk, September, 1906, *M. C. Jansen*, as *R. virginica;* border of gum swamp, Pungo Causeway near Land of Promise, Princess Anne Co., *Fernald & Griscom*, no. 2856; dry clay of open woods and thickets, north of Blackwater River, Princess Anne County, *Fernald & Long*, no. 4066; open clay at border of woods, east of Little Creek, Princess Anne County, July 31, 1934, *Fernald & Long*, no. 4064 (type in Gray Herb.); wet roadside ditch near Princess Anne Courthouse, *Fernald & Griscom*, no. 2857; wet meadow near Pungo, Princess Anne County, *Fernald & Griscom*, no. 2858. North Carolina: grassy roadside bank, 8 miles south of Williamstown, Martin Co., *Wiegand & Manning*, no. 2146, as *R. mariana:* open dry sandy field, 6 miles west of Greenville, Pitt Co., *Wiegand & Manning*, no. 2148 (mixed with *R. mariana*).

Photo. *E. C. Ogden*

ROTALA RAMOSIOR, var. INTERIOR: FIG. 1, portion of TYPE, × 1, from Tennessee; FIG. 2, fruit, × 5, from Ohio: FIG. 3, fruit (transitional), × 5, from Missouri.
R. RAMOSIOR (typical): FIG. 4, fruits, × 5, from Connecticut.

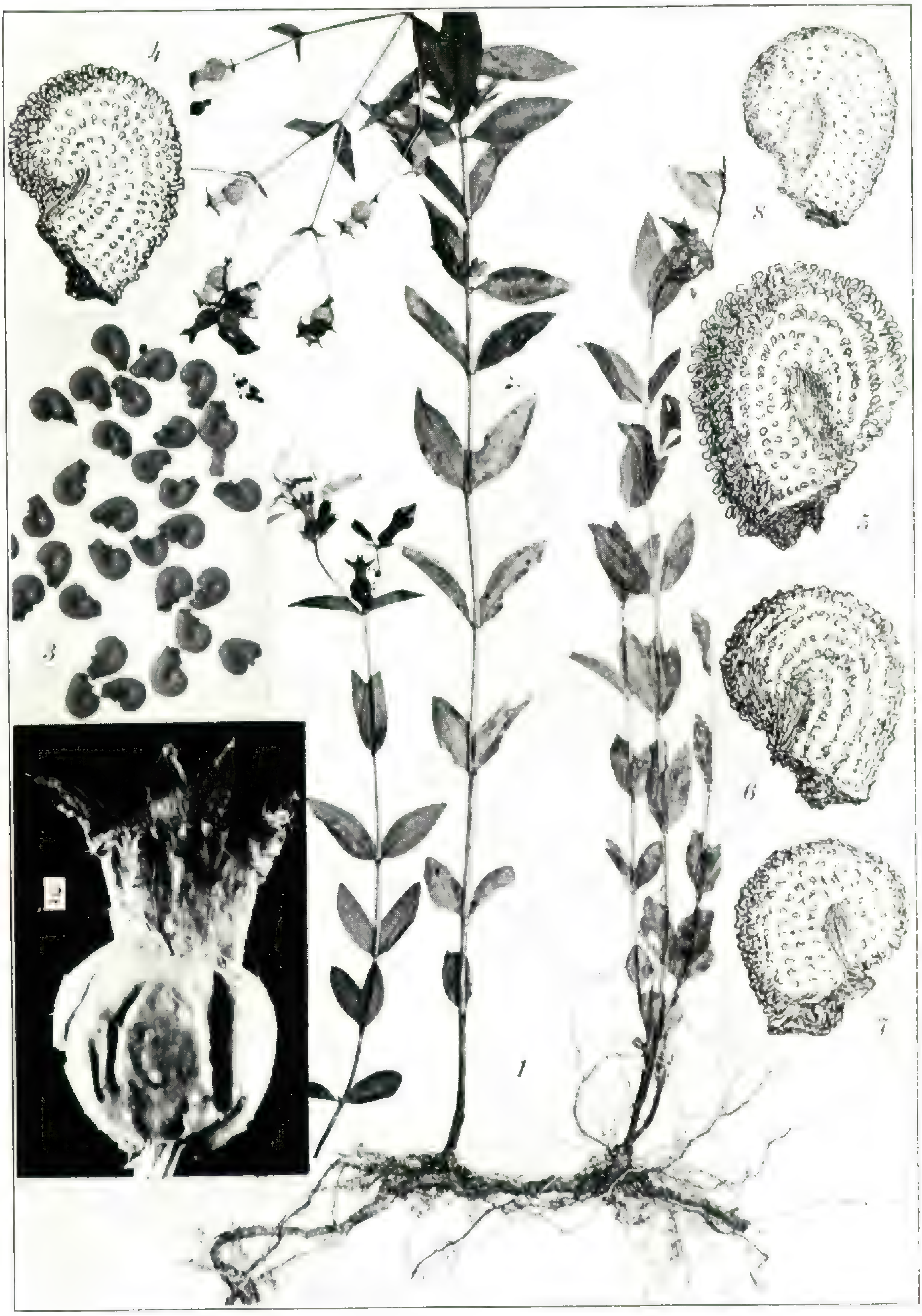

Photo. *E. C. Ogden*, drawings by *Ruth Peabody*.

RHEXIA VENTRICOSA: FIG. 1, TYPE, from Virginia, × ½; FIG. 2, fruiting hypanthium, × 4, from TYPE; FIG. 3, seeds, × 10 (by *J. F. Collins*) from Virginia; FIG. 4, seed, × 50, (from TYPE).

R. VIRGINICA: FIG. 5, seed, × 50, from Massachusetts.

R. INTERIOR: FIG. 6, seed, × 50, from Missouri.

R. MARIANA: FIG. 7, seed, × 50, from Massachusetts.

R. MARIANA, var. LEIOSPERMA: FIG. 8, seed, × 50, from Texas (TYPE).

Rhexia ventricosa superficially looks somewhat intermediate between *R. mariana* and *R. virginica*, but has a root system unlike either, a deep tap-root as in *R. virginica* but without the tubers which characterize that species, and horizontally spreading substoloniform branches (which occasionally develop slender stolons). Its stems are obviously square in section, but without the wing-angles of well developed *R. virginica* and the pubescence is sparser than in *R. mariana*. The leaves are somewhat intermediate in shape but without the distinct petiole and the well developed axillary fascicles of *R. mariana*. The flowers and fruits are nearly as in *R. mariana*, var. *purpurea* (*R. Nashii*) but the neck of the hypanthium is relatively short, and the calyx-lobes are nearly as long as the neck. The seeds lack a well developed dorsal crest and, under magnification, appear falsely alveolate from the deep shadows between the distinct or evenly spaced papillae.

The tendency of *Rhexia ventricosa* to prefer dryish or merely damp clay will be noted in the citation of specimens. In Princess Anne County we saw no *R. virginica*, though Fernald and Long got it in wet peat in a piece of pine barren in Norfolk Co., in 1934; and in both Princess Anne and Norfolk Counties *R. mariana*, var. *typica* seems to be wanting, its place there being taken by the southern var. *purpurea* (*R. Nashii*).

Rhexia ventricosa is, apparently, nearly related to *R. interior* Pennell: but it has a much larger hypanthium, with the ventricose body of greater diameter (whence the name), the calyx-lobes much larger and the papillae of the seeds slenderly columnar (in *R. interior* low and dome-like).

The Variations of Ludwigia sphaerocarpa (Plate 348). As currently interpreted *Ludwigia sphaerocarpa* Ell. Sk. Fl. S. C. and Ga. i. 213 (1821), of the southeastern coastal plain, extends northward to eastern Massachusetts and reappears in the isolated area of coastal plain types in northern Indiana. Our collection from Cape Henry, however, departs so definitely from the typical plant described by Elliott and, at the same time, is so unlike the plant with which we are familiar in Massachusetts, that it has seemed desirable to study the series with care. We find that the species breaks very naturally into four geographic trends.

Rameal leaves strongly reduced, glabrous or pubescent, lanceolate.
- Mature hypanthium small, 2.5–3.2 mm. long by 2.8–4 mm. broad, averaging broader than long.
  - Hypanthium only pubescent: glabrous leaves narrowly linear-lanceolate and attenuate . . . . . Var. *typica*.
  - Hypanthium, branches and leaves pubescent: leaves more broadly lanceolate, not attenuate . . . . . Var. *jungens*.
- Mature hypanthium larger, 3.5–4.6 mm. long, 3.2–4 mm. broad, averaging longer than broad . . . . . Var. *macrocarpa*.

Rameal leaves scarcely smaller than the primary ones, pubescent, narrowly oblong: stems pubescent: hypanthium pubescent, 3 mm. long, about as wide . . . . Var. *Deamii.*

Var. **typica** (figs. 1 and 2). *L. sphaerocarpa* Ell. l. c. (1821).—Coastal plain, from Louisiana to Florida, north to North Carolina, rarely to Rhode Island. The following northern specimens have been seen: New Jersey: Bennett, Cape May Co., August 29, 1922, *J. M. Fogg, jr.*, no. 359. New York: Southampton, Long Island, *St. John*, no. 2829. Rhode Island: Worden's Pond, South Kingstown, Washington Co., August 16, 1930, *Anderson, Collins, Lownes & Weatherby.*

In var. *typica* the flowers are mostly remote on the elongate branches; the "*Leaves* 2 inches long, 2 lines wide, very acute, base also acute, glabrous"—Elliott.

Var. **jungens,** var. nov. (figs. 3 et 4), var. *typicae* simillima a qua differt ramis foliisque pubescentibus, foliis lanceolatis vix attenuatis.—Southeastern Virginia to southern New Jersey and eastern Pennsylvania. Virginia: pool in sandy barrens, Cape Henry, September 23, 1933, *Fernald & Griscom*, no. 2862 (type in Gray Herb., isotype in herb. Griscom; growing dominantly in pool with *Psilocarya scirpoides*, var. *Grimesii*—see p. 00). Delaware: Ellendale, September 1, 1892, *A. Commons* (mixed with *L. linearis*). Pennsylvania: Bristol, *E. Diffenbaugh.* New Jersey: Cold Spring, Cape May Co., *Gershoy*, no. 504; Hammonton, Atlantic Co., 1882, *F. L. Bassett*, and 1917, *Gershoy*, no. 505.

Var. **macrocarpa,** var. nov. (figs. 5 et 6), var. *typicae* simillima a qua differt foliis glabris latioribus lanceolatis acutis vix attenuatis; floribus plerumque approximatis vel subapproximatis; fructibus 3.5–4.6 mm. longis, 3.2–4 mm. latis.—New Jersey to southeastern New York and eastern Massachusetts. Seen from the following localities: New Jersey: Quaker Bridge, Atlantic Co., September, 1867, *C. F. Parker;* Delanco, Burlington Co., *Hermann*, no. 3638. New York: Staten Island, September, 1879, *N. L. Britton;* Manor, Long Island, 1871, *E. S. Miller;* Peekskill, Westchester Co., *Browne;* Lake Mohegan, July 24, 1887, *J. W. Martens, jr.* Connecticut: West Pond, North Guilford, numerous collections; Killingworth, *E. H. Eames*, no. 11,046. Rhode Island: Cranston, Providence Co., August, 1907, *Thos. Hope.* Massachusetts: Fall River, August 15, 1913, *Sanford;* Lakeville, Plymouth Co., numerous collections (type: stony shore of Quitacas Pond, Lakeville, August 27, 1899, *W. P. Rich* in Gray Herb.); Upper Waltham Pond, near Prospect Hill (locality probably destroyed), *Asa Gray;* common in Concord River from Bedford to Billerica, numerous collections.

Var. **Deamii,** var. nov. (figs. 7 et 8), ramis foliis fructibusque pubescentibus; foliis anguste oblongis, longioribus vix 4 cm. longis obtusiusculis, foliis ramulorum vix reductis; fructibus 3 mm. longis, 3 mm. latis.—Indiana: low border of Lake Walker, northwest of

Baileytown, Porter Co., August 23, 1925, *C. C. Deam*, no. 42,350 (TYPE in Gray Herb.).

NOTES ON LUDWIGIA, § ISNARDIA (PLATE 349). In studying our material it became apparent that this section of *Ludwigia* was in need of revision. In the latest treatment, in Small's Manual, four species of *Isnardia* are recognized, based primarily on the length of the capsule. Concerning *L. spathulata* T. & G. we have nothing to add; it seems to be a unique species.

Another well known southern species is *Ludwigia natans* Ell. or *Isnardia natans* (Ell.) Kuntze. This now appears as *I. repens* (Sw.) DC., based on *L. repens* Sw. Fl. Ind. Occ. i. 273, t. 8 (1797), a name preoccupied by one of the North American representatives of *L. palustris* (L.) Ell., which was first recognized as differing from the European type as *L. repens* Forst. Cat. Pl. N. Am. 22 (1771). There prove to be two strong tendencies of *L. natans* in the southeastern United States and a third isolated in southern California. These are characterized in the following key.

Mature fruit (excluding calyx-lobes) 4–5.6 (–6) mm. long. *L. natans*, var. *typica*.
Mature fruit 6–10 mm. long, usually more tapering at base.
  Fruit sessile or subsessile.................................Var. *rotundata*.
  Fruit on distinct pedicels up to 4 mm. long................Var. *stipitata*.

L. NATANS Ell., var. **typica**. *L. natans* Ell. Sk. Bot. S. C. and Ga. i. 581 (1821). *Isnardia natans* (Ell.) Ktze. Rev. Gen. i. 251 (1891). *I. intermedia* Small & Alexander in Small, Man. Fl. Se. U. S. 940 or *I. media* Small & Alexander, l. c. 1506 (1933), illegitimate names under the International Rules as adopted at Cambridge until validated by a Latin diagnosis.—Florida to Texas, north, locally, to North Carolina, Tennessee and Missouri; also Bermuda. FIG. 2, fruit, × 4.

Var. **rotundata** (Griseb.), comb. nov. *Isnardia repens*, var. *rotundata* Griseb. Cat. Pl. Cub. 107 (1866). *L. repens* Sw. Fl. Ind. Occ. i. 273, t. 8 (1797), not Forst. (1771). *I. repens* (Sw.) DC. Prodr. iii. 60 (1828). *L. fluitans* Scheele, Linnaea, xxi. 580 (1848). *L. repens*, β. *rotundata* (Griseb.) Gomez, Anal. Hist. Nat. Madrid, xxiii. 66 (1894). FIG. 3, fruit, × 4.

The Grisebach type was the rather unusual aquatic state of the long-fruited variety with dilated leaves, whereas most specimens in the herbaria are of the terrestrial state, with narrower and firmer leaves. The variety occurs in Mexico, the Greater Antilles, Bermuda, and from Georgia and Florida to Texas.

Var. **stipitata**, var. nov. (FIGS. 1 et 4), var. *rotundifoliae* simillima a qua differt floribus fructibusque pedicellatis, pedicellis usque ad 4 mm. longis.—CALIFORNIA: San Bernardino, August, 1881, *S. B. & W. F. Parish*, no. 682 (TYPE in Gray Herb.); other collections from

the same region by *Parish Bros.* and by *G. R. Vasey.* Fig. 1, node, × 1; fig. 2, flower, × 4.

Ludwigia natans is most readily distinguished from the somewhat smaller *L. palustris* by its lacking the 4 longitudinal green bands on the hypanthium and by often having in their place 1 or more free or partly free long and narrow bractlets borne well above the base, the very short bractlet of *L. palustris*, when present, being basal.

There prove to be at least four strongly developed geographic trends in *Ludwigia palustris*, the typical Linnean plant being essentially European (extending slightly into western Asia and northern Africa). The four varieties may be distinguished as follows:

Longitudinal green bands of the hypanthium terminating well below the sinuses; body of fruit whitish and corky, 4–5.3 mm. long . . . . Var. *typica.*
Longitudinal green bands extending nearly or quite to the sinuses; body of the darker and less corky fruit 2–4.5 mm. long.
- Mature hypanthium 2 (rarely 1.8)–3.5 mm. in diameter at the middle; calyx-lobes broadly deltoid.
  - Leaf-blades of terrestrial state long-petioled, subacute to short-pointed, broad: calyx-lobes scarcely acuminate . . . Var. *americana.*
  - Leaf-blades of terrestrial state short-petioled, usually acuminate and narrower: calyx-lobes acuminate . . . . . . Var. *pacifica.*
- Mature hypanthium 1.4–2 mm. in diameter at the middle; calyx-lobes narrowly deltoid to broadly lanceolate, acuminate: leaves long-petioled . . . . . . Var. *nana.*

L. palustris (L.) Ell., var. **typica**. *Isnardia palustris* L. Sp. Pl. 175 (1753). *L. palustris* (L.) Ell. Sk. Fl. S. C. and Ga. 211 (1821), as to name-bringing synonym.—Europe and adjacent Asia and Africa. Fig. 7, fruit, × 4.

Var. **americana** (DC.), comb. nov. *Isnardia palustris*, β. *americana* DC. Prodr. iii. 61 (1828). *L. repens* Forst. Cat. Pl. N. Am. 22 (1771), not Sw. (1797). *L. apetala* Walt. Fl. Carol. 89 (1788). *L. nitida* Michx. Fl. Bor.-Am. i. 87 (1803). *I. ascendens* Hall in Eat. & Wr. N. Am. Bot. 285 (1840). *L. palustris*, var. *Liebmanni* Lévl. Bull. Geogr. Bot. xxii. 24 (1912).—Nova Scotia, New Brunswick and southern Quebec to Minnesota, south to Georgia, Louisiana and Texas; eastern Washington, eastern Oregon and northeastern California to Guatemala; also Bermuda. Fig. 8, fruit, × 4.

Var. **pacifica**, var. nov. (figs. 5 et 9), var. *americanae* simillima a qua differt foliis angustioribus lanceolatis vel anguste ellipticis, apice attenuatis breviter petiolatis; fructibus 2.8–3.4 mm. longis, 2.2–2.8 mm. latis, lobis calycis anguste deltoideis acuminatis.—Pacific Coast from Vancouver Island and western Washington to California. Type: gravelly shore, Sproat Lake, Vancouver Island, July 14, 1914, *W. R. Carter*, no. 128 (in Gray Herb.). Fig. 5, small plant of type collection, × 1; fig. 9, fruit, × 4.

Var. **nana**, var. nov. (figs. 6 et 10), var. *americanae* simillima a qua differt laminis foliorum longe petiolatis minoribus rare 2.5 cm. longis;

fructibus 2.2–3 mm. longis 1.4–2 mm. latis, lobis calycis anguste deltoideis vel late lanceolatis acuminatis.—Southern Georgia and Florida along the Gulf to Texas; also Cuba, Haiti, southeastern Mexico and Columbia. TYPE: Cameron, LOUISIANA, July 5, 1903, *S. M. Tracy*, no. 8718 (in Gray Herb.). FIG. 6, fruiting branch, × 1; FIG. 10, fruit, × 4.

Var. *nana* in its small fruits and leaves is the greatest departure from typical *L. palustris.* Whereas the foliage of the terrestrial and aquatic states is very different in the other varieties, the two states are barely distinguishable in var. *nana.*

PROSERPINACA PALUSTRIS AND ITS VARIETIES.—The plant of southeastern Virginia impressed us as somewhat unlike the more familiar variation in the North. This impression was due to the large, broad-faced and very thin-angled fruits, whereas the plant of wide range, from Nova Scotia to Wisconsin, south to the interior of Georgia and Oklahoma has smaller and more elongate fruits 2.3–4 mm. broad, with merely subacute angles, while an extreme variation of the interior, var. *amblyogona* Fern. RHODORA, xi. 120 (1909), has the angles strongly rounded or almost obsolete.

The plant with broad and thin-angled concave-sided fruits 4–6 mm. broad has been called *P. palustris,* var. *latifolia* Schindler in Engler, Pflanzenr. iv[225]. 76 (1905); also *P. platycarpa* Small, Bull. N. Y. Bot. Gard. iii. 432 (1905). Var. *amblyogona* has also been taken up as a species, *P. amblyogona* (Fern.) Small, Man. Se. Fl. 954 (1933). In their vegetative characters there are no constant differences and the fruits show many transitions. Geographically, many of the plants of the coastal plain area from New Jersey to Nova Scotia are clearly transitional between the commoner northern variation and that of the Southeast. Similarly in the interior, it is sometimes difficult to recognize var. *amblyogona.*

Most unfortunately, a study of the type in the Linnean herbarium, the material described as *Proserpinaca palustris* L. Sp. Pl. 88 (1753), proves it to be the southeastern broad-fruited extreme, the plant called by Schindler var. *latifolia,* by Small *P. platycarpa.* Five ripe fruits remained (1934) on the type and two of these are actually a little larger than the largest fruit on a reference sheet from Cape May, New Jersey. It, accordingly, becomes necessary to characterize the common northern plant as

PROSERPINACA PALUSTRIS L., var. **crebra,** var. nov., fructibus minoribus 2.3–4 mm. latis, angulis subacutis nec alatis.—Nova Scotia to Wisconsin, south to Georgia and Oklahoma. TYPE:

Hampton, New Hampshire, August 31, 1902, *E. F. Williams* (in Gray Herb.).

Ipomoea hederacea (L.) Jacq., var. integriuscula Gray. Virginia: roadside bank, Back Bay, Princess Anne Co., no. 2877.

Cited by Small under *Pharbitis barbigera* (Sims) G. Don, only north to Georgia. The fresh flowers were bright azure-blue; in the dried material they have faded to reddish-pink.

Lippia lanceolata Michaux. Michaux described *L. lanceolata* "foliis lineari-lanceolatis" from the Ashley River, South Carolina. Nevertheless, the species, given a broad inland range, was described by Gray with leaves "varying from obovate and lanceolate-spatulate to ovate" and with the special comment "name therefore inapt." Gray's impression was due to the fact that in his day there was no material in the Gray Herbarium (at least) of the narrower-leaved plant which Michaux had accurately described (plate 350, fig. 1). We now know the narrow-leaved extreme as a plant of the outer coastal plain, from Cape May, New Jersey to South Carolina and Louisiana. The wide-ranging broad-leaved extreme seems to have no available name and we, therefore, call it

Lippia lanceolata Michx., var. **recognita**, var. nov. (tab. 350, fig. 2), foliis obovatis vel late lanceolato-spathulatis vel anguste ovatis.—Type: swampy places, Fremont Co., Iowa, July 30, 1898, *T. J. Fitzpatrick* in Gray Herb. Eastern Pennsylvania to southern Ontario, Iowa and Nebraska, south to Florida, Louisiana, Texas and adjacent Mexico.

Physalis maritima M. A. Curtis. Virginia: sand hills, Cape Henry, no. 2885.

Physalis maritima is the maritime plant, with elliptic or oblong and obtuse stellate-puberulent leaves attenuate to the short petiole, which is included in the North American treatments under *P. viscosa* L. The latter species was based, however, both by Linnaeus and Gronovius (before him) on a plant described and excellently illustrated by Dillenius from Buenos Aires, with cordate leaves. Abundant material from Argentina and adjacent countries well represents *P. viscosa,* which has nothing to do with the plant of coastal sands of our southeastern states.

The ascription of *Physalis viscosa* of American authors to "Virginia" goes back to Gronovius, who, obviously, had something else in hand.

Galium tinctorium L., var. floridanum Wieg. Virginia: brackish marsh, Pungo Ferry, Princess Anne Co., no. 2890.

Although Wiegand cited this variety only from Florida, our material is a perfect match for the type-collection.

Eupatorium cuneifolium Willd., var. **semiserratum** (DC.), comb. nov. *E. semiserratum* DC. Prodr. v. 177 (1836).

We are unable to find any characters in the involucres, corollas and achenes by which to keep *E. semiserratum* specifically apart from *E. cuneifolium.* The extreme difference in leaf-outline and degree of toothing is marked but many transitional specimens occur.

Eupatorium rotundifolium and Allies. Long field experience with *Eupatorium rotundifolium* and the plants associated with it as related species, in many parts of their range, has convinced us that extensive modification of the present specific concept is necessary, if we are to interpret correctly the highly variable mass of material. As currently treated, the series *Rotundifoliae* consists of *E. sessilifolium* L., a glabrous plant with obtuse or obtusish involucral bracts and very long-acuminate, finely serrate leaves with strongly rounded to truncate, closely sessile bases; and, set off from this usually clear-cut species, another group, *E. rotundifolium* L., *E. pubescens* Muhl., *E. scabridum* Ell. and *E. verbenaefolium* Michx., characterized by acute to attenuate inner bracts and shorter, thicker and pubescent blunt or merely acute leaves, with coarser and blunter toothing. These four prove to be bewilderingly variable in shape, size and toothing of the leaves; and search for more stable characters has led us to the conclusion that the treatment of Asa Gray in the Synoptical Flora was correct, *E. scabridum* and *E. pubescens* being reduced to varietal rank under *E. rotundifolium.* We should go further and unite with them *E. verbenaefolium* of current treatments (*E. teucrifolium* of the Synoptical Flora). *E. sessilifolium* has the tube of the corolla nearly equaling the throat (as in *E. hyssopifolium*), while all the others agree in having the tube much shorter than the throat. In every other character extreme specimens in both groups definitely converge.

Eupatorium sessilifolium is primarily a species of rich or calcareous areas and is unknown on the typical sandy and acid soils of the coastal plain, where the others are dominant. It is ordinarily very distinct from the other four, separated by the characters noted above; but from Maryland and the District of Columbia inland to the mountains of Virginia, West Virginia and Tennessee a remarkable extreme is dominant, which entirely lacks the characters conventionally ascribed to the species, except in having the corolla of *E. sessilifolium.* The stem of this plant is densely cinereous-puberulent; both surfaces of the leaves are often similarly and densely puberulent; and the

leaves are shorter, broadly ovate to ovate-lanceolate and acute, but never with the long acumination characteristic of typical glabrous *E. sessilifolium.* This plant, has consequently, been distributed by collectors either as *E. sessilifolium ?*, *E. pubescens* or a hybrid of the two; and it was described as *E. Vaseyi* by Porter, Bull. Torr. Bot. Cl. xix. 128 (1892). Having the distinctive corolla of *E. sessilifolium*, this plant is evidently a well defined variety of that species. The type, from Lookout Mt., Tennessee, kindly loaned by Dr. Maxon to Dr. Robinson, is before us as we write. The other specimens examined by us are enumerated below, under

E. sessilifolium L., var. **Vaseyi** (Porter), comb. nov. *E. Vaseyi* Porter, Bull. Torr. Bot. Cl. xix. 128 (1892). Maryland: dry woods between Quantico and Salisbury, *Tidestrom*, no. 7427. District of Columbia: in vicinis Washington, September 30, 1877, *L. F. Ward;* Brooklands, September 1, 1895, *Holm;* thickets, September 11, 1896, *Steele.* Virginia: The Pinnacle, Lee Co., July 27, 1892, *Small;* Halifax, August, 1927, *Wm. Rhoades;* Bedford Co., August 31, 1871, *A. H. Curtiss;* Craigs, Craig Co., *Steele*, no. 21; dry rocky woods along Potto Creek, 7 miles from Covington, Alleghany Co., *Griscom*, no. 18,780. West Virginia: Dailey's Post Office, Jefferson Co., *Wm. Palmer*, no. 49; dry roadside thicket, Upshur Co., *S. S. Dickey*, no. 156.

The other four so-called "species" prove to have no constant or fundamental characters separating them. The plants currently called *E. verbenaefolium* and *E. rotundifolium* are two well marked extremes, but *E. pubescens* is a hopeless series of leaf variations, containing every possible connecting stage between these two extremes in outline. Indeed, unrecorded variations have membranaceous and smooth, instead of thick and rough, leaves; while occasional plants have obtusish rather than acutish bracts. Eighty per cent of the plants growing west of or outside of the coastal plain belong to this intermediate series, and field experience is required to understand their distribution. Thus, in the Shenandoah valley and in the Alleghanies of Virginia and West Virginia, one of the surprises of local work is the presence of coastal plain species in limestone barrens or sandy valleys, with the rich piedmont flora flourishing on the wooded hillsides a hundred yards away. No hint of this situation can be found on the labels of older collections.

There are also difficulties in nomenclature. The available names are nearly all specific; they are old names and the types, all in European herbaria, have never been critically discussed by a person familiar with the genus today. Photographs of nearly all of them are now in the Gray Herbarium, thanks to the interest of Dr. Robinson, who

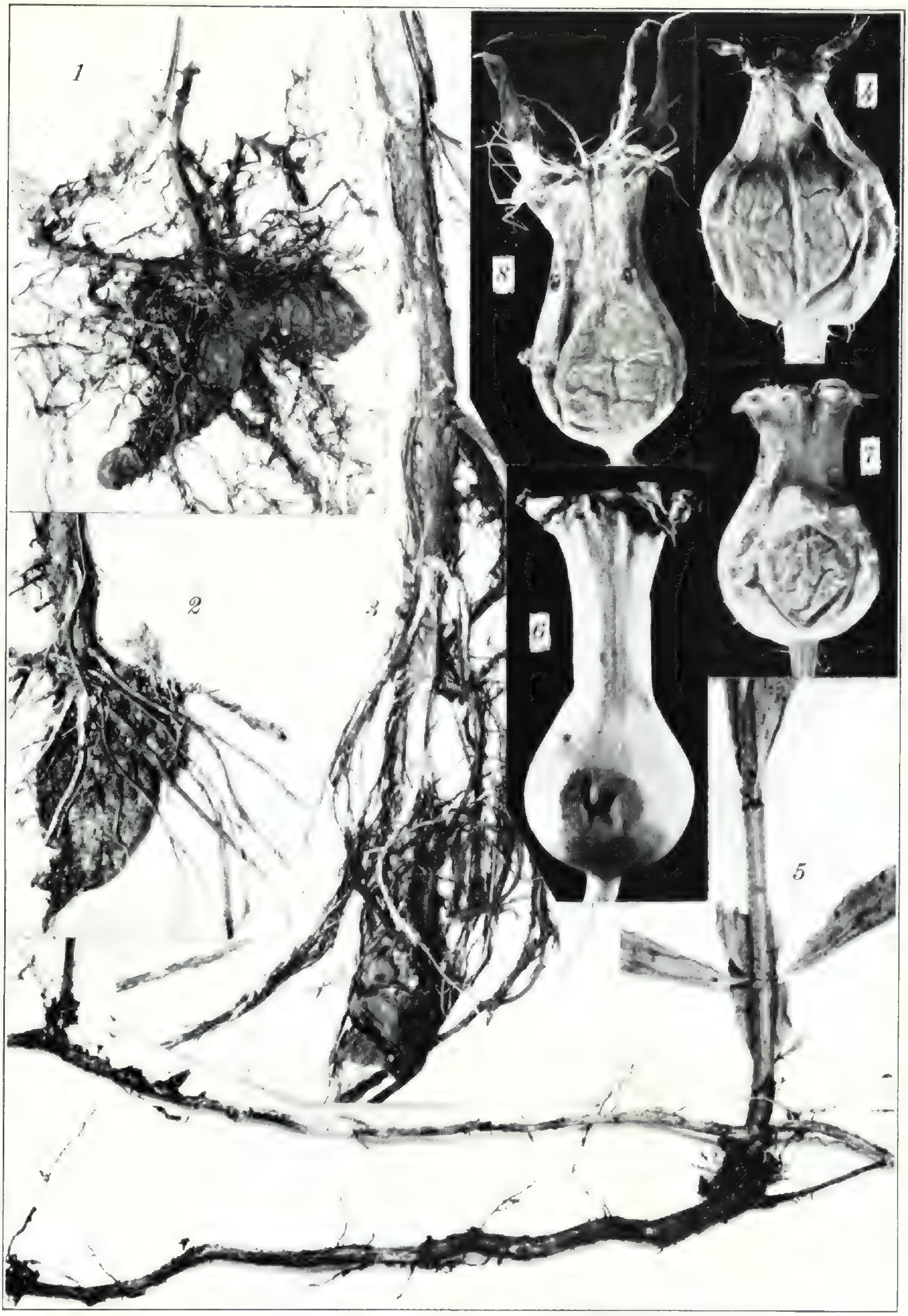

Photo. *E. C. Ogden.*

RHEXIA VIRGINICA, bases of plant, × 1: FIG. 1, from gravel; FIG. 2, from moss; FIG. 3, from bog; FIG. 4, fruiting hypanthium, × 4, from West Virginia.

R. MARIANA, var. PURPUREA: FIG. 5, base of plant, × 1, from Virginia; FIG. 6, fruiting hypanthium, × 4, from Mississippi.

R. INTERIOR: FIG. 7, fruiting hypanthium, × 4, from Missouri.

R. ARISTOSA: FIG. 8, fruiting hypanthium, × 4, from Georgia.

Photo. *E. C. Ogden.*

VARIETIES OF LUDWIGIA SPHAEROCARPA; habit, × 1; fruit, × 4.
Var. TYPICA: FIGS. 1 and 2, from Georgia.
Var. JUNGENS: FIGS. 3 and 4, from Delaware.
Var. MACROCARPA: FIGS. 5 and 6, from Massachusetts (TYPE).
Var. DEAMII: FIGS. 7 and 8, from Indiana (TYPE).

Photo. *J. F. Collins.*

Ludwigia, § Isnardia; branches, × 1; fruits, × 4.
L. natans, var. typica: fig. 2, from Florida.
L. natans, var. rotundata: fig. 3, from Texas.
L. natans, var. stipitata: figs. 1 and 4, from California.
L. palustris, var. typica: fig. 7, from Russia.
L. palustris, var. americana: fig. 8, from Massachusetts.
L. palustris, var. pacifica: figs. 5 and 9, from Vancouver Island (type).
L. palustris, var. nana: fig. 6, from Florida; fig. 10, from Louisiana (type).

Photo. *E. C. Ogden.*

Lippia lanceolata: fig. 1, flowering branch, × 1, from Virginia.
L. lanceolata, var. recognita: fig. 2, flowering branch, × 1, from Iowa (type).

has most kindly placed them at our disposal. Their study makes it quite impossible to endorse current stereotyped usage in several cases. A summary of these types is given below.

E. ROTUNDIFOLIUM L. = *E. rotundifolium* as currently understood.
E. VERBENAEFOLIUM Michx. = *E. pubescens* as currently understood.
E. TEUCRIFOLIUM Willd. = *E. pubescens* as currently understood.
E. PUBESCENS Muhl. = *E. pubescens* as currently understood.
E. LANCEOLATUM Muhl. in Willd., of which we have seen no photograph but of which Muhlenberg's own material is preserved at the Academy of Sciences of Philadelphia, is clearly the narrow-leaved extreme of *E. verbenaefolium* as currently understood, and Asa Gray was quite correct in citing it under his *E. teucrifolium*, not the *E. teucrifolium* of Willd.

Those who wish to maintain these three "species" must determine the identity of Walter's *E. pilosum* and *E. Marrubium* to settle the nomenclature. We cannot interpret *E. Marrubium* any better than Asa Gray, but *E. pilosum* is obviously either the *E. pubescens* or *E. verbenaefolium* of current manuals and is a far older name than either. We do not settle the identity of these Walter types, as we do not regard these plants as species and are consequently solely concerned with varietal names. We recognize the following varieties:

E. ROTUNDIFOLIUM L., var. **typicum.** *E. rotundifolium* L. Sp. Pl. 837 (1753).—Leaves suborbicular to broadly deltoid-ovate, relatively small, the middle ones 2–5.5 cm. long, nearly as broad as long, usually strongly canescent on both surfaces; the rounded to subacute teeth relatively uniform; uppermost leaves very rarely alternate (in only 3 out of 65 sheets examined).—Passing freely into

Var. OVATUM (Bigelow) Torrey in DC. Prodr. v. 178 (1836). *E. ovatum* Big. Fl. Bost. ed. 2: 296 (1824). *E. pubescens* Muhl. in Willd. Sp. Pl. iii. 1755 (1804).—Leaves often less pubescent, in extreme cases thinner and glabrate, with coarser toothing; lower and median ovate to elliptic or broadly oblong, obtuse to subacute; the middle ones 4–10 cm. long; uppermost leaves rarely alternate (in 13 out of 74 examined).

Var. SCABRIDUM (Elliott) Gray, Syn. Fl. i.[2] 99 (1884). *E. scabridum* Ell. Sk. ii. 298 (1821–24).—Stems puberulent; leaves scabrous-puberulent, rhombic-ovate, often cuneate at base, the larger 3–6.5 cm. long, the toothing much as in var. *typicum;* uppermost cauline leaves rarely alternate (in 4 out of 23).

Var. **lanceolatum** (Muhl.), comb. nov. *E. lanceolatum* Muhl. ex Willd. Sp. Pl. iii. 1752 (1804). *E. verbenaefolium* of recent authors, not Michx. *E. teucrifolium* of recent authors, not Willd.—Lower and middle leaves narrowly lance-ovate to elliptic-oblong, obtuse to acute; the median 4–9 cm. long, with relatively few, coarse teeth, the lower teeth often prolonged; uppermost leaves narrowly ovate to lanceolate, acute to acuminate, usually alternate (in 68 out of 78); pubescence and texture much as in var. *ovatum.*

Eupatorium perfoliatum L., var. **colpophilum**, var. nov., a forma typica differt caulibus glabratis vel puberulis; foliis glabrescentibus angustioribus 0.6–2.5 cm. latis; involucris glabrescentibus nec non dense pilosis.—Tidal flats of the St. Lawrence River, Quebec and the Kennebec-Androscaggin system, Maine. The following (all collections seen from these estuaries) belong here. Quebec: Berthier, Montmagny Co., July 14, 1922, *Fernald & Pease*, no. 25,296; Berthier, August 13, 1925, *Rousseau*, no. 21,300 (type in Gray Herb.); St. Augustine, Portneuf Co., August 7, 1923, *Svenson & Fassett*, nos. 2050 and 2051 (individual with 3 leaves); Beauport, August 8, 1922, *Victorin*, no. 15,347. Maine: Bowdoinham, September 14 and 19, 1916, *Fernald & Long*, no. 14,650; Bowdoinham, August 24, 1921, *Fassett*, nos. 343–346.

Much of the Maine material has been referred to forma *purpureum* Britton, because of the purplish involucres and flowers. Forma *purpureum*, however, is a purplish-flowered form of typical *E. perfoliatum*, with densely pilose involucre and pubescent leaves. Var. *colpophilum* was detected by us while studying the variations of *E. perfoliatum* in our Virginia collections. The species is very variable and we feel, after going over much material, that var. *truncatum* (Muhl.) Gray (*E. truncatum* Muhl.) is not a true variety or anything but an occasional aberration. *E. cuneatum* Engelm. (*E. perfoliatum*, var. *cuneatum* Engelm.), however, with campanulate heads and short round-tipped involucral bracts is apparently a distinct species, nearly related to the local *E. resinosum* Torr. of pine barrens of New Jersey and Delaware.

Liatris graminifolia Willd., var. **Smallii** (Britton), comb. nov. *Laciniaria Smallii* Britton, Man. 927 (1901). Virginia: dry oak woods, The Desert, Cape Henry, no. 2907.

Our material, growing with other typical Alleghenian plants in comparatively rich woods, is a perfect match for the type-collection of *Laciniaria Smallii*, from Iron Mountain, Smyth Co. A well defined variety on account of its comparatively open inflorescence, often with peduncled heads, and its often broad lower leaves, the plant seems to have no satisfactory characters to separate it specifically from *Liatris graminifolia*. Var. *Smallii* is a characteristic plant of the Alleghenies from southwestern Virginia to Georgia and Tennessee. Its discovery at Cape Henry adds another to the considerable list of Alleghenian types isolated there.

In studying the variations of *Liatris graminifolia* one other variety has seemed to us specially worthy of note. This is the hirsute plant, dominant near the northern end of the range of the species, in New

Jersey, and occurring locally southward to Florida. This is the plant which was apparently intended as *Laciniaria graminifolia pilosa* by Britton, as indicated by the description and range given in his Manual, 927 (1901). The combination, first made by Britton (Mem. Torr. Bot. Cl. v. 314) in 1895, rested, however, directly upon *Serratula pilosa* Ait. Hort. Kew, iii. 138 (1789) and was supposed to cover also *Liatris graminifolia*, var. *dubia* (Barton) Gray. As to *Serratula pilosa*, Aiton's description was brief but very definite: "S. foliis linearibus pilosis, floribus axillaribus longe pedunculatis." The second phrase alone should indicate that Aiton had something quite unlike *Liatris graminifolia*, which has the heads sessile or on peduncles shorter than the involucres. Fortunately fragments of a head from Aiton's type, long ago presented to Asa Gray, are before us. These show the involucral bracts to be linear and acute, thus proving conclusively that *Serratula pilosa* has nothing to do with *Liatris graminifolia*.

Liatris dubia Bart., to which Gray doubtfully referred *Serratula pilosa*, is, as shown by Barton's plate and description, suggestive of Aiton's plant but, again, cannot be closely related to *Liatris graminifolia*.

Liatris graminifolia Willd. Sp. Pl. iii. 1636 (1804), itself was a mixture at the start. Willdenow gave an original diagnosis which is clearly recognizable; but he derived the name from Walter's *Anonymos graminifolius*, Fl. Car. 197 (1788). The latter, however, was described as 6 feet (1.8 m.) high, a measurement seemingly impossible for our plant. Since, however, Willdenow's account contained an original diagnosis and a more detailed original description of a specimen actually before him, we are leaving *Liatris graminifolia* as Willdenow's species.

The hirsute plant should be called

L. GRAMINIFOLIA Willd., var. **lasia**, var. nov., foliis hirsutis; caule plus minusve hirsutis. TYPE: dry sandy soil, Lindenwold, Camden Co., NEW JERSEY, September 29, 1923, *J. M. Fogg, jr.*, no. 622 (in Gray Herb.). Frequent in southern New Jersey and locally southward on the outer coastal plain to Florida. Our collection from Virginia is from dry sandy barrens, Cape Henry, no. 2909, growing with typical *L. graminifolia* (no. 2908).

ASTER SUBULATUS Michx., var. **euroauster**, var. nov. (TAB. 251, FIGS. 1 et 3), capitulis plerumque dissitis vix glomerulatis; involucris 5–7 mm. longis; bracteis scariosis lineari-attenuatis; foliis plerumque anguste linearibus.—Brackish to fresh wet places, eastern Massachusetts to Florida; inland near Syracuse, New York; chiefly southern.

Type: border of gum swamp near North Landing, Norfolk Co., Virginia, September 22, 1933, *Fernald & Griscom*, no. 2919 (in Gray Herb.; isotype in herb. Griscom).

Typical *Aster subulatus* Michx. Fl. Bor.-Am. ii. 111 (1803) is the plant common on salt marshes and brackish shores from New Hampshire to Delaware, the whole plant often suffused with purple, the slightly larger heads (6–8 mm. long) tending to become crowded and subsessile (fig. 2), the bracts herbaceous and lance-linear, the basal and cauline leaves tending to lanceolate rather than narrowly linear. Var. *euroauster* is far more characteristic of brackish tide-water or even fresh habitats northward, whereas typical *A. subulatus* is most characteristic of open salt marshes.

According to Gray (Synoptical Flora), *Aster subulatus* of Michaux was a mixture of *A. exilis* Ell. from "Carolinae" and *A. subulatus* in our sense from "Pensylvaniae." Gray, as the first reviser of the tangle, took up the latter element as typical *A. subulatus* and his notations on the sheets which were before him indicate the coarser salt marsh plant of the North as true *A. subulatus;* while two sheets from Florida of var. *euroauster* were marked "a slender Florida form."

Iva frutescens L., var. **oraria** (Bartlett), comb. nov. *I. oraria* Bartlett, Rhodora, viii. 26 (1906).

The plants of marshes in Princess Anne Co., like specimens from Cape Charles, have the leaves nearly as in *I. oraria*, but the smaller and more subsessile heads of *I. frutescens.* The achenes might go with material of either extreme. A transitional series, combining in varying degrees the foliage and the involucres and achenes of the two, extends from southeastern Virginia to Cape May. North of southern New Jersey the larger-headed and broader-leaved var. *oraria* alone seems to be found; south of Virginia the material is all the narrow-leaved and usually smaller-headed typical *I. frutescens.*

Ambrosia artemisiaefolia and its Variations in temperate eastern North America. The polymorphous annual weed, well known to every one as Ragweed or Bitterweed, consists of many trends, which in the North American Flora are treated by Rydberg as about 10 species. Without venturing on a final decision regarding the status of some of these, it is clear to us that in the northeastern United States and adjacent Canada all the variations belong to one specific type. We should classify them as follows:

Leaves simple, coarsely pinnatifid or rarely bipinnatifid: staminate involucres 3–7 mm. broad. . . . . *A. artemisiaefolia* (typical).

Leaves bi- to tripinnatifid, with smaller segments: staminate involucres 1.5–5 mm. broad.
Staminate involucre 2.5–5 mm. broad.
Plant glabrous or appressed-pubescent.................... Var. *elatior.*
Plant spreading-villous.......................... Var. *elatior*, f. *villosa.*
Staminate involucre 1.5–2.5 mm. broad.................. Var. *paniculata.*

A. ARTEMISIAEFOLIA L. Sp. Pl. ii. 988 (1753); Rydb. N. Am. Fl. xxxiii. 18 (1922).—Sea-beaches and cultivated or waste land, Magdalen Islands and Nova Scotia to Pennsylvania and (acc. to Rydberg) District of Columbia.

Var. ELATIOR (L.) Descourtils, Fl. Ant. i. 239, t. 55 (1821). *A. elatior* L. l. c. (1753); Rydb. l. c. (1922).—Ubiquitous weed of United States and southern Canada, extending to the West Indies and naturalized in Europe.—*A. media* Rydb. Bull. Torr. Bot. Cl. xxxvii. 127 (1910) seems to us only a stiffish inland phase of var. *elatior;* and *A. glandulosa* Scheele, Linnaea, xxii. 157 (1849) and *A. diversifolia* (Piper) Rydb. N. Am. Fl. l. c. (1922) seem hardly recognizable.

Forma **villosa**, f. nov., var. *elatiori* similis sed caulis foliisque plus minusve villosis, villis divergentibus.—Prince Edward Island to Oregon and southward. TYPE: Fayette, IOWA, August, 1894, *Bruce Fink* in Gray Herb.

Var. PANICULATA (Michx.) Blankinship, Rep. Mo. Bot. Gard. xviii. 173 (1907). *A. paniculata* Michx. Fl. Bor.-Am. ii. 183 (1803). *A. monophylla* Walt. Fl. Carol. 232 (1788).—Southeastern United States, north, locally, as a weed to Massachusetts, New Hampshire and New York.

It is possible that there is an earlier valid varietal name, but var. *paniculata,* based upon *A. paniculata,* is definite; other names, like var. *jamaicensis* Griseb. Fl. Brit. W. Ind. 370 (1861), based merely on the cutting of the leaf are not clearly identifiable.

HIERACIUM GRONOVII L., var. FOLIOSUM Michx. VIRGINIA: dry oak woods, Cape Henry, nos. 2934, 2935.

Hieracium Gronovii L. has two strong varietal tendencies. Typical *H. Gronovii,* as determined by Asa Gray, on comparing the Clayton (Gronovian) specimen, is equivalent to var. *nudicaule* Michx. Fl. Bor.-Am. ii. 87 (1803) and includes var. *subnudum* Torr. & Gray, Fl. ii. 477 (1843). This plant has the larger leaves subbasal as in *H. venosum* or extending remotely up the lower third of the stem and rarely more than 4 or 5 in number. Its inflorescence is open and varying from thyrsoid-cylindric to almost corymbose. The latter plants strongly simulate *H. venosum* but can always be distinguished from it by the markedly fusiform or upwardly attenuate achenes and by the stouter and more heavily glandular pedicels.

Var. *foliosum,* which is clearly an earlier name for the plant described as var. *hirsutissimum* Torr. & Gray, l. c. (1843) and as *H.*

pensilvanicum Fries Symb. Hierac. 150 (1844), has numerous cauline leaves extending nearly or quite into the inflorescence, more oval and rounded at summit, the panicle slenderly cylindric-ellipsoid and commonly 2–7 dm. long. It is dominant on the coastal plain, extending rather rarely into southern New England and northward in the interior to southern Indiana and Missouri; whereas typical *H. Gronovii* predominates northward and in the interior.

EXPLANATION OF PLATES 332–351

PLATE 332. JUNIPERUS VIRGINANA L.: FIG. 1, adult foliage, × 10, from Tower Rock, Missouri, *Gleason*, no. 1778; FIG. 2, foliage and fruit, × 10, from Nimmo, Virginia, *Fernald & Griscom*, no. 2703; FIG. 3, foliage, × 10, from Cedar Cliff Mt., Buncome Co., North Carolina, *Biltmore Herb.*, no. 2624; FIG. 4, foliage, × 10, from Waynesboro, Tennessee, *Svenson*, no. 4308 (transition to var. *crebra*); FIG. 5, seed, × 10, from Tower Rock, Missouri, *Gleason*, no. 1778; FIG. 6, seed, × 10, from Cliff Mt., North Carolina, *Biltmore Herb.* no. 2624; FIGS. 7 and 8, seeds, × 10, from same no. as FIG. 2; FIG. 9, seed, × 10, from Tennessee, *Svenson* no. 4308 (transition to var. *crebra*).

PLATE 333. JUNIPERUS VIRGINIANA, var. CREBRA, n. var.: FIG. 1, adult foliage, × 10, from McCall's Ferry, Pennsylvania, *Heller & Halbach*, no. 705; FIG. 2, foliage, × 10, from Barnstable, Massachusetts, *Fernald & Long*, no. 17,797 (TYPE); FIG. 3, foliage, × 10, from Fairfield, Connecticut, October 1, 1899, *E. H. Eames;* FIG. 4, foliage, × 10, from West Fort Anne, New York, November 12, 1895, *S. H. Burnham;* FIG. 5, seed, × 10, from Pennsylvania, *Heller & Halbach*, no. 705; FIG. 6, seed, × 10, from Fairfield, Connecticut, *Eames;* FIG. 7, seed, × 10, from West Fort Anne, New York, *Burnham;* FIG. 8, seed, × 10, from Massachusetts, *Fernald & Long*, no. 17,797 (TYPE).

PLATE 334. CINNA ARUNDINACEA L.: FIG. 3, spikelets, × 12, from the type region, environs de Montréal, *Victorin*, no. 28,445.

C. ARUNDINACEA, var. INEXPANSA, n. var.: FIG. 1, panicle, × 1, from North Landing, Norfolk Co., Virginia, *Fernald & Griscom*, no. 2732; FIG. 2, spikelets, × 12, from no. 2732.

C. LATIFOLIA (Trev.) Griseb.: FIG. 4, spikelets, × 12, from Grand Falls, Newfoundland, *Fernald & Wiegand*, no. 4586.

PLATE 335. ARISTIDA LANOSA Muhl. var. MACERA, n. var.: FIG. 2, plant, × ½, from Cape Henry, Virginia, *Fernald & Griscom*, no. 2719 (TYPE); FIG. 1, lemma, × 2, from no. 2719.

PLATE 336. ECHINOCHLOA PUNGENS (Poir.) Rydb., var. COARCTATA, n. var.: FIG. 1, panicle, × 1, from Pungo Ferry, Princess Anne County, Virginia, *Fernald & Griscom*, no. 2760 (TYPE); FIG. 2, spikelet, × 10, from no. 2760.

E. PUNGENS, var. LUDOVICIANA (Wieg.) Fern. & Grisc.: FIG. 3, spikelet, × 10, from Baton Rouge, Louisiana, *Billings*, no. 14 (TYPE).

PLATE 337. VARIATIONS OF ANDROPOGON VIRGINICUS L., panicles × ½: FIG. 1, A. VIRGINICUS (GENUINUS), from Newport, Delaware, Sept. 30, 1899, *W. M. Canby;* FIG. 2, var. GLAUCUS Hackel, from Okeechobee region, Brevard Co., Florida, *Fredholm*, no. 6121; FIG. 3, var. TETRASTACHYUS (Ell.) Hackel., from Jacksonville, Florida, *A. H. Curtiss*. no. 5571; fig. 4, var. GLAUCOPSIS (Ell.) Hitchc., from Apalachicola, Florida, *Biltmore Herb.* no. 921 a.

PLATE 338. VARIATIONS OF ANDROPOGON VIRGINICUS, panicles × ½: FIG. 1, var. TENUISPATHEUS (Nash) Fern. & Grisc., from near St. Petersburg, Florida, *C. C. Deam*, no. 1886; FIG. 2, var. CORYMBOSUS (Chapm.) Fern. & Grisc., from Florida, 1884, *A. H. Curtiss;* FIG. 3, var. ABBREVIATUS (Hack.) Fern. & Grisc., from Hammonton, New Jersey, *Gershoy*, no. 30.

PLATE 339. VARIATIONS OF ANDROPOGON SCOPARIUS Michx., racemes × 2, habits × ½: FIG. 4, A. SCOPARIUS (GENUINUS), from Florida, *Chapman:* FIG. 3, var. FREQUENS Hubbard, from Block Island, Rhode Island, *Fernald*,

Long & Torrey, no. 8476 (TYPE); FIGS. 1 & 2, var. SEPTENTRIONALIS, n. var., from Baie Sherley, Riv. Ottawa, Quebec, *Rolland-Germain*, no. 19,199 (TYPE); FIG. 5, var. NEO-MEXICANUS (Nash) Hitchc., from Cedar Point, Erie Co., Ohio, *R. J. Webb*, no. 5503.

PLATE 340. VARIATIONS OF ANDROPOGON SCOPARIUS, racemes × 2, habit × ½: FIGS. 1 & 2, var. DUCIS, n. var., from Naushon, Dukes Co., Massachusetts, *Fogg*, no. 2940 (TYPE); FIG. 3, var. DIVERGENS Hackel, from Braidentown, Florida, *Combs*, no. 1298 (type of var. *polycladus* Scribn. & Ball); FIG. 4, var. LITTORALIS (Nash) Hitchc., from Cape Henry, Virginia, *Fernald & Griscom*, no. 2768.

PLATE 341. CYPERUS STRIGOSUS L., umbels × 1: FIG. 1, TYPE in Herb. Linnaeus (from photograph sent by Mr. S. SAVAGE, Assistant Secretary of the Linnean Society of London); FIG. 2, Texas, *Drummond*, no. 287 (ISOTYPE of *C. uniflorus* Torr. & Hook.); FIG. 3, west of San Antonio, Texas, *E. Palmer*, no. 2018 (as *C. uniflorus*); FIG. 4, Auburn, Maine, August 18, 1888, *J. C. Parlin;* FIG. 5, Placerville, California, *Bolander*, no. 6224 (as *C. stenolepis* [Wats., not] Torr. = *C. Hanseni* Britton); FIG. 6, Agricultural College, Mississippi, August 24, 1889, *F. S. Earle;* FIG. 7, Adams, Massachusetts, *M. A. Day*, no. 37.

PLATE 342. CYPERUS RETRORSUS Chapm., var. TYPICUS: FIG. 1, inflorescence, × 1, from High Springs, Florida, *Wiegand & Manning*, no. 466 (distributed as *C. cylindricus*), a close match for Chapman's type; FIG. 2, spike, × 4, from no. 466.

C. RETRORSUS, var. NASHII (Britton) Fern. & Grisc.: FIG. 3, part of inflorescence, × 1, from Eustis, Lake Co., Florida, *Nash*, no. 1196 (ISOTYPE of *C. Nashii*); FIG. 4, spike, × 4, from no. 1196.

C. RETRORSUS, var. CYLINDRICUS (Ell.) Fern. & Grisc.: FIG. 5, inflorescence, × 1, from Middle Oconee River, Clarke Co., Georgia, *Harper*, no. 100; FIG. 6, spike, × 4, from no. 100.

C. RETRORSUS, var. DEERINGIANUS (Britton & Small) Fern. & Grisc.: FIG. 7, portion of inflorescence, × 1, from near Great Bridge, Norfolk Co., Virginia, *Fernald & Long*, no. 3725; FIG. 8, spike, × 4, from no. 3725.

PLATE 343. CYPERUS FILICULMIS Vahl, var. OBLITUS, n. var.: FIG. 1, inflorescence, × 1, from Cape Henry, Virginia, *Fernald & Griscom*, no. 2793 (TYPE); FIG. 2, glomerule, × 2, from TYPE.

C. FILICULMIS, var. MACILENTUS Fernald: inflorescence, × 2, from Orono, Maine, *Fernald*, no. 343 (TYPE).

C. FILICULMIS (typical): FIG. 4, ripe glomerule, × 2, from Alva, Oklahoma, *Stevens*, no. 1667 (characteristic *C. Bushii* Britton); FIG. 5, ripe glomerule, × 2, from Hingham, Massachusetts, September 6, 1914, *J. R. Churchill;* FIG. 6, ripe glomerule, × 2, from Cedar Cliff Mountain, North Carolina, *Biltmore Herb.* no. 329a.

PLATE 344. PSILOCARYA SCIRPOIDES Torr.: FIG. 3, inflorescence, × 1, from Brewster, Massachusetts, *Fernald*, no. 16,336; FIG. 4, achene, × 35, from Plymouth, Massachusetts, *Oakes*.

P. SCIRPOIDES var. GRIMESII, n. var.: FIG. 1, inflorescence, × 1, from Cape Henry, Virginia, *Fernald & Griscom*, no. 2770; FIG. 2, achene (with top of style broken off), × 35, from Lake Drummond, Dismal Swamp, Virginia, *Grimes*, no. 4534 (TYPE).

P. NITENS (Vahl) Wood: FIG. 5, achene, × 35, from Santee Canal, South Carolina, *Ravanel*.

P. CORYMBIFERA (C. Wright) Benth.: FIG. 6, achene (without beak), × 35, from near Pinar del Rio, Cuba, *C. Wright*, no. 3774 (TYPE).

PLATE 345. ROTALA RAMOSIOR (L.) Koehne, var. INTERIOR, n. var.: FIG. 1, portion of TYPE, × 1, from Knox Co., Tennessee, *Ruth*, no. 224; FIG. 2, fruits, × 5, from near Cincinnati, Ohio, September 2, 1883, *C. G. Lloyd;* FIG 3, fruits, transitional, × 5, from Webb City, Missouri, *E. J. Palmer*, no. 2626.

R. RAMOSIOR: FIG. 4, fruits, × 5, from Island Brook Reservoir, Bridgeport, Connecticut, September 20, 1896, *E. H. Eames*.

Plate 346. Rhexia ventricosa, n. sp.: fig. 1, fruiting plant and flowering tip, × ½, from east of Little Creek, Princess Anne Co., Virginia, *Fernald & Long*, no. 4046 (type); fig. 2, fruiting hypanthium, × 4, from type; fig. 3, seeds, × 10, from near Pungo, Princess Anne Co., Virginia, *Fernald & Griscom*, no. 2870; fig. 4, seed, × 50, from type.

R. virginica L.: fig. 5, seed, × 50, from Brewster, Massachusetts, *Fernald & Long*, no. 17,196.

R. interior Pennell: fig. 6, seed, × 50, from Waco, Missouri, *E. J. Palmer*, no. 1256.

R. mariana L.: fig. 7, seed, × 50, from Brewster, Massachusetts, *Fernald*, no. 18,818.

R. mariana, var. leiosperma, n. var.: fig. 8, seed, × 50, from Montgomery Co., Texas, *R. A. Dixon*, no. 487 (type).

Plate 347. Rhexia virginica L.: fig. 1, base of plant showing tuber and stolons, × 1, from cobbly beach of St. John's (Wilson's) Lake, Yarmouth Co., Nova Scotia, *Fernald, Bartram & Long*, no. 24,194; fig. 2, base of plant, showing tuber and stolon, × 1, from sphagnum, near Williamsburg, Virginia, *Grimes*, no. 4315; fig. 3, elongate and spongy base of plant, × 1, from a bog, Cold Spring, New Jersey, *Gershoy*, no. 499; fig. 4, fruiting hypanthium, × 4, from Buckhannon, West Virginia, *S. S. Dickey*, no. 195.

R. mariana L., var. purpurea Michx.: fig. 5, base of plant showing horizontal rhizomatous stems, × 1, from Cape Henry, Virginia, *Fernald & Long*, no. 4061; fig. 6, fruiting hypanthium, × 4, from Ocean Springs, Mississippi, *Pollard*, no. 1077.

R. interior Pennell: fig. 7, fruiting hypanthium, × 4, from Waco, Missouri, *E. J. Palmer*, no. 1256.

R. aristosa Britton: fig. 8, fruiting hypanthium, × 4, from Sumter Co., Georgia, *Harper*, no. 466.

Plate 348. Ludwigia sphaerocarpa Ell., var. typica: fig. 1, portion of fruiting plant, × 1, from Valdosta, Georgia, *A. H. Curtiss*, no. 6710; fig. 2, fruit, × 4, from no. 6710.

Var. jungens, n. var.: fig. 3, top of a fruiting plant, × 1, from Ellendale, Delaware, September 1, 1892, *Commons;* fig. 4, fruit, × 4, from same.

Var. macrocarpa, n. var.: fig. 5, portion of fruiting plant, × 1, from Lakeville, Massachusetts, August 27, 1899, *W. P. Rich* (type); fig. 6, fruit, × 4, from the type.

Var. Deamii, n. var.: fig. 7, portion of fruiting plant, × 1, from Lake Walker, Porter Co., Indiana, *Deam*, no. 42,350 (type); fig. 8, fruit, × 4, from type.

Plate 349. Ludwigia, § Isnardia. L. natans Ell., var. typica: fig. 2, fruit, × 4, from Braidentown, Florida, *Tracy*, no. 7592.

L. natans, var. rotundata (Griseb.) Fern. & Grisc.: fig. 3, fruit, × 4, from Texas, *E. Hall*, no. 223.

L. natans, var. stipitata, n. var.: fig. 1, node, × 1, from San Bernardino, California, 1881, *G. R. Vasey;* fig. 2, flower, × 4, from same collection.

L. palustris (L.) Ell., var. typica: fig. 7, fruit, × 4, from Subcarpathian Russia, *Margittal* in Fl. Exsicc. Reipubl. Bohem. Slov.. no. 349.

L. palustris, var. americana (DC.) Fern. & Grisc.; fig. 8, fruit, × 4, from Hyannisport, Massachusetts, August 9, 1888, *Walter Deane*.

L. palustris, var. pacifica Fern. & Grisc.: fig. 5, small plant, × 1, from type-collection, Sproat Lake, Vancouver Island, *W. R. Carter*, no. 128; fig. 9, fruit, × 4, from type.

L. palustris, var. nana, n. var.: fig. 6, fruiting branch, × 1, from Florida, *Chapman* in Bilt. Herb. no. 600a; fig. 10, fruit × 4, from Cameron, Louisiana. *Tracy*, no. 8718 (type).

Plate 350. Lippia lanceolata Michx.: fig. 1. flowering branch, × 1, from Knott's Island, Virginia, *Fernald & Long*, no. 4155.

L. lanceolata, var. recognita, n. var.: fig. 2, flowering branch, × 1, from the type, Fremont Co., Iowa, *Fitzpatrick*.

Photo. *E. C. Ogden.*

ASTER SUBULATUS, var. EUROAUSTER: FIG. 1, portion of TYPE, × 1, from Virginia; FIG. 3, heads, × 2, from TYPE.
A. SUBULATUS (typical): FIG. 2, heads, × 2, from Massachusetts.

Plate 351. Aster subulatus Michx., var. euroauster, n. var.: fig. 1, portion of flowering plant, × 1, from North Landing, Norfolk Co., Virginia, *Fernald & Griscom*, no. 2919 (type) · fig. 3, heads, × 2, from type.
A. subulatus (typical): fig. 2, heads, × 2, from Scituate, Massachusetts, September 6, 1896, *E. F. Williams*.

ADDITIONAL NOTES ON THE FLORA OF COLUMBIA, MISSOURI

Francis Drouet

During the past season, study in the flora of Columbia, Missouri, has been continued; and many of the older collections by Daniels (Univ. Mo. Stud. Sci. Ser. **1**(2). 1907), Rickett (Univ. Mo. Stud. **6**(1). 1931), and their associates have been carefully reviewed. In the course of the field work, an attempt has been made to visit the intermediate and outlying parts of the region from which specimens have not before been recorded. If the field study proceeds at the rate it has assumed the past year, it may safely be predicted that the entire region will require examination during all seasons of the year for at least five more years before we can generalize as to the abundance or rarity of individuals or of species. A number of species reported by Tracy (Mo. State Hort. Soc. Rep. 1885, appendix. 1886) and by Daniels[1] but not substantiated by specimens in the Herbarium of the University of Missouri (or elsewhere, according to our present knowledge) have been restored to the known flora in the lists in my previous notes (Rhodora **35**: 359 ff. 1933) and in the present paper.

Collections made in September, 1933, indicate that in certain portions of southern Boone and Callaway Counties not covered by the Memphis silt loam (brown loess) many species found otherwise in Missouri only in the Ozarks may be encountered. *Bumelia lanuginosa*, *Cunila origanoides*, *Solidago petiolaris* var. *Wardii*, *Aster patens*, and others were found in an afternoon about Claysville. Spring and summer collecting may discover more of such "Ozarkian" species new or "lost" to the flora, perhaps among them the once collected *Erythronium americanum* and *Castilleja coccinea*. On the

[1] We must recognize the fact that Dr. Francis Daniels possessed a considerable knowledge of the flora of the northeastern States and discriminated carefully among the specific entities represented on his herbarium sheets, though we at present disagree with much of his nomenclature and many of his identifications. It may well be noted here that his accumulation of specimens, most of which were of his own collecting, comprises almost half of our present herbarium.

railroad tracks north of Browns Station and Hallsville, where the original prairie vegetation is partially preserved in the right-of-way, *Lespedeza capitata, Cornus racemosa, Boltonia latisquama,* and *Helianthus rigidus* were found to be abundant. These areas, with the Perche Creek valley near Harrisburg and the great unknown northwestern and eastern parts of the Columbia region, offer almost untouched collecting-grounds for future students of the local flora.

Mr. Lisle Jeffrey has been a tireless collector and critic during the past season's work. Mr. B. F. Bush, Dr. J. A. Steyermark, and Mr. E. J. Palmer have seen and given opinions on many of the specimens cited below; and I am grateful to them for their suggestions. Dr. L. H. Bailey reviewed the collections of *Vitis* and *Rubus.* Dr. R. C. Friesner looked over certain of the goldenrods. I am indebted also to Dr. W. E. Maneval, Mr. A. A. Jeffrey, and many others for specimens and invaluable criticism.

In the list below, the species collected and reported in the region for the first time are marked by an asterisk (*).

Adiantum Capillus-Veneris L. A fragmentary specimen marked "Columbia, Mo." in the G. C. Broadhead Herbarium, Mo. Bot. Gard. Cited by Pinkerton, Ann. Mo. Bot. Gard. **20**: 46, fig. 2. 1933.

Athyrium asplenioides (Michx.) Desv. *Asplenium Filix-femina* of Gray's Manual, 7th ed., in part. See Rhodora **21**: 179. 1919. A single frond marked "From bed, Columbia, Mo.," also in the Broadhead Herbarium, Mo. Bot. Gard. Cited by Palmer and Steyermark, Amer. Fern Jour. **22**: 114, and by Pinkerton, *loc. cit.* Whether or not the specimen was taken from a cultivated plant is uncertain.

Thelypteris hexagonoptera (Michx.) Weatherby. *Phegopteris hexagonoptera* (Michx.) Fée. See Rhodora **21**: 179. 1919. On shady loess banks at a salt lick one mile north of Highway 40 just west of the M. K. & T. Railroad bridge, Howard Co., *Drouet 432,* May 30, 1933.

*Osmunda Claytoniana L. A few plants were discovered by Mr. Jeffrey and Dr. Steyermark on wooded banks near the sandstone bluffs of Hinkson Creek, *Jeffrey 248,* Sept. 6, 1933.

Alisma Plantago-aquatica L. subsp. brevipes (Greene) Sam., Ark. f. Bot. **24**A (7): 19. 1932. "Shore of Hinkson dam," *Daniels,* July 15, 1902.

Alisma subcordatum Raf. *A. Plantago-aquatica* of the Columbia *Floras,* in part. Not uncommon in old ponds and along shores of creeks. See Ark. f. Bot. **24**A (7): 33. 1932.

*Lemna perpusilla Torr. Pond near Rocheport, *L. R. Setty,* Aug. 1933. The specimen was determined by Dr. Albert Saeger.

*Pogonia trianthophora (Sw.) BSP. On rotted logs in low woods

near Highway C, three miles east of Harrisburg, *Jeffrey & Drouet 1207*, Sept. 23, 1933.

Spiranthes gracilis (Bigel.) Beck. "Low sandstone woods 1 mile west of Highway 63 on Harrisburg Road," *Jeffrey 324*, Sept. 23; pasture-land on the Roby Farm southeast of Rocheport, *Jeffrey 249*, Sept. 8, 1933. See Rickett's *Flora*, p. 25. Reported by Daniels.

Urtica procera Muhl. *U. gracilis* of Amer. Auth., not Ait. See Rhodora **28**: 192–195. 1926. See Rickett's citation in the *Flora*, p. 29.

Comandra Richardsiana Fernald. *C. umbellata* of the Columbia *Floras*, not Nutt.

Polygonum Hydropiper L. var. projectum Stanford, Rhodora **29**: 86. 1927. *P. Hydropiper* of Amer. Auth., in part. *P. Hydropiper* of the Columbia *Floras*.

Polygonum hydropiperoides Michx. See Rhodora **28**: 24. 1926. Abundant in swampy ground along Gans Creek 2½ miles northeast of Providence, *Drouet 1023*, Aug. 24, 1933. Reported by Daniels.

Polygonum sagittatum L. See Rhodora **35**: 362. 1933. Additional collections were made in low ground along Gans Creek 2½ miles northeast of Providence, *Drouet 1026*, and in a swale just east of Mill Creek by Highway KK, *Drouet 1040*, Aug. 24, 1933.

*Polygonum tenue Michx. Prairie by Highway 63 west of Sturgeon, *Drouet 1092*, Sept. 3, 1933.

Atriplex patula L. var. hastata (L.) Gray. A naturalized weed that may prove to be generally distributed in waste places about Columbia, as described by Daniels (Mo. State Hort. Soc. Rep. 1898: 156). Recently found in a yard on College Ave., *Drouet 941*, Aug. 11, and in an alley by Hitt St. north of Cherry St., *Drouet 1219*, Sept. 29, 1933.

Acnida tamariscina (Nutt.) Wood. Generally distributed as a weed. New collections come from a garden in East Highlands, Columbia, *Drouet 915*, Aug. 9, and from cut-over timber-land northeast of Claysville, *Drouet 1233*, Sept. 30, 1933. A fragmentary specimen, *Daniels*, Aug. 1897, from "bottoms of the Missouri, Providence," and labeled *Amarantus hybridus*, is referable to this species.

*Oxybaphus linearis (Pursh) Robinson. *Allionia linearis* Pursh. On limestone bluffs of the Missouri River southeast of Rocheport, *Jeffrey & Drouet 1116*, Sept. 8, 1933. To be referred to this species is a broader-leaved specimen from near Balanced Rock, south of Columbia, *Drouet*, Aug. 27, 1931.

Arenaria stricta Michx. var. texana Robinson. *Sabulina texana* (Robinson) Rydb. This species is of possibly wider distribution in the Columbia region than Rickett (*Flora*, p. 33) indicates. Daniels (*Flora*, p. 137) says of it: "rare south along Hinkson Creek." We have collected it on limestone pinnacles along Cedar Creek two miles southeast of Selby (Barnes Chapel), *Allan Jeffrey & Drouet 956*, Aug. 12, 1933.

Claytonia virginica L. Including *C. robusta* of Drouet, Rhodora **35**: 362, not Rydb.?

Plants answering to the description of *C. robusta* were collected and observed in various places in the spring of 1933. These robust, broad-leaved individuals were found invariably in shady, loose soil—about trunks of trees and bases of large rocks and beneath bushes. In adjacent open ground, packed more or less hard by animals and rain and exposed to the sun, linear-leaved plants referable to *C. virginica* grew. Between the two extremes of soil types were plants with leaves intermediate in shape. At least about Columbia, the forms characterized by broad leaves appear to belong to but one species and should be retained in *C. virginica*. Plants with still broader and more bluntly tipped blades appear as solitary specimens to be referable to *C. caroliniana* Walt. in its more robust state; but these plants have been seen likewise only in shady, loose soil, always accompanied by the linear-leaved individuals in the full sunlight a few feet away. A host of intermediate forms are found between. My 303, from the Ashland Road just south of Columbia, April 8, 1933, illustrates a few types of these plants collected in a small area. The problem is made more interesting by the observation that the plants in the loose soil begin growth and attain maturity earlier in the season than do those in the packed soil.

Nelumbo pentapetala (Walt.) Fernald. *N. lutea* Ait. In a pond by Oakland Road just north of Paris Road, *Jeffrey & Drouet 712*, July 21, 1933. See Rhodora **36**: 23. 1934.

Delphinium Ajacis L. Escaped in waste places and established on banks of Highway K south of Hinkson Creek, *Drouet 730*, July 24, 1933. See Rickett's note in the *Flora*, p. 35.

Benzoin aestivale (L.) Nees. Ridge northeast of Huntsdale, *Jeffrey 222*, Aug. 27, 1933. This is the first specimen that we have seen from Boone Co. since Broadhead's collection in 1857 (see Rickett's *Flora*, p. 36).

Cardamine parviflora L. var. arenicola (Britton) O. E. Schultz. *C. parviflora* of Amer. Auth., not L. See Rhodora **29**: 191–192. 1927.

Descurainia intermedia (Rydb.) Daniels, Univ. Mo. Stud. Sci. Ser. **1**(2): 147. 1907. *Sisymbrium canescens* Nutt. var. *brachycarpon* (Richards.) Wats. All specimens placed in *S. brachycarpon* and *S. canescens* by Rickett and in *D. intermedia* and *D. canescens* by Daniels are referred to this species.

Sedum triphyllum (Haw.) S. F. Gray. *S. purpureum* Tausch. *S. Telephium* of the Columbia *Floras*, not L. See Rhodora **11**: 46. 1909.

Amelanchier canadensis (L.) Medic. Including var. *Botryapium* of Rickett's *Flora*. See Rhodora **14**: 150. 1912.

Malus ioensis Brit. var. Palmeri Rehd., in Man. Cult. Trees & Shrubs, 399. 1927. *Pyrus ioensis* Bailey *var.* "Thicket s[outh] of golf-links, Columbia," *Daniels*, Apr. 26, 1902.

Potentilla simplex Michx. var. typica Fernald. *P. canadensis* Amer. Auth., in part, not L. See Rhodora **33**: 189. 1931. *P. canadensis* and the var. *simplex* of Rickett's *Flora*.

Rubus allegheniensis Porter, not of Rickett's *Flora*. See Gentes Herb. **2**(6): 380. 1932. Along a roadside eight miles north of Columbia, *Drouet 405*, May 18, 1933.

Rubus Enslenii Tratt. See Gentes Herb. **2**(6): 325. "Wild places, Columbia," *Daniels*, July 1903; County Road Prairie, Callaway Co., *Drouet 475*, June 3, 1933.

Rubus frondosus Bigel. See Gentes Herb. **2**(6): 402 and **3**(5): 258. A "western representative," according to Dr. Bailey's label. In the "swamp south," *Drouet*, May 29, 1932. Rickett's *R. frondosus* is *R. abactus* Bailey.

*Rubus laudatus Berger. See Gentes Herb. **3**(5): 265–267. 1934. Sandstone bluffs of Hinkson Creek, *Rickett 362*, May 16, 1932; Tinspout Spring, *Drouet 413*, May 21, 1933.

Rubus ostryifolius Rydb. See Gentes Herb. **2**(6): 392. Including Rickett's *R. allegheniensis* and Daniels' *R. nigrobaccus*.

Crotalaria sagittalis L. Abundant by the railroad north of Browns Station, *Jeffrey & Drouet 697*, July 21, 1933.

Trifolium dubium Sibth. "Pastures; rare. Columbia, Mo.," *Daniels*, July, 1897.

Acalypha gracilens Gray var. monococca Engelm. See Rhodora **29**: 203. 1927. *A. gracilens* of the Columbia *Floras*.

Euphorbia obtusata Pursh. *E. missouriensis* Small. *E. dictyosperma* of Daniels and Rickett.

*Callitriche heterophylla Pursh. Pond in the County Road Prairie, Callaway Co., *Jeffrey & Drouet 470*, June 3, 1933.

Vitis cinerea Engelm. Including *V. aestivalis* of the Columbia *Floras*.

Vitis Linsecumii Buckl. Two specimens probably referable to this species, according to Dr. Bailey: "swamp s[outh], Columbia," *Daniels*, Aug. 1904; "Round Pool," *Rickett*, May 25, 1927. See Gentes Herb. **3**(4): 192. 1934.

Vitis palmata Vahl. "Along streams, Columbia," *Daniels*, Aug. 1904.

*Hibiscus militaris Cav. Low ground between McBaine and Huntsdale, *Jeffrey 221*, Aug. 27, 1933.

Gaura parviflora Dougl. Abundant on hillsides on the University Farm east of the sheep barn, Columbia, *Jeffrey & Drouet 575*, June 27, 1933.

*Ludwigia polycarpa Short & Peter. Bank of Hinkson Creek at Grindstone Creek, *Jeffrey & Drouet 1147*, Sept. 15; low ground along railroad north of Hallsville, *Jeffrey & Drouet 1176*, Sept. 16, 1933.

Cornus racemosa Lam. *C. paniculata* L'Hér. *C. candidissima* of Rickett and of Drouet. Apparently more widely distributed in the region than formerly supposed. Additional collections are: thickets near the sandstone bluffs of Hinkson Creek, *Drouet 805*, July 29, 1933; hillside by Hinkson Creek north of Tinspout Spring, *Drouet 904*, Aug. 9, 1933; fence-rows and low thickets by the railroad north of Hallsville, *Jeffrey & Drouet 1174*, Sept. 16, 1933. See Rehder, Man. Cult. Trees & Shrubs, 670. 1927.

*Bumelia lanuginosa Walt. Missouri River bluffs near Wilton P. O., *A. A. Jeffrey 307*, Sept. 17, 1933; along Claysville Road near Highway 63, Boone Co., *Jeffrey 351*, Sept. 30, 1933.

*Cuscuta glomerata Choisy. *C. paradoxa* Raf. County Road Prairie, Callaway Co., *Jeffrey & Drouet 827, 830*, July 30; roadside two miles east of Deer Park, *Jeffrey & Drouet 946*, Aug. 12; railroad north of Hallsville, *Jeffrey & Drouet 1173*, Sept. 16, 1933.

Ipomoea coccinea L. By Black's Mill Road south of Columbia, *Drouet 1159*, Sept. 15; weed about buildings in Claysville, *Drouet 1221*, Sept. 30, 1933. Steyermark (Rhodora **35**: 289) describes this species as "only sporadically adventive in the state."

Ipomoea lacunosa L. "Fence-row; rare. Columbia," *Daniels*, July 1897; horticultural plots, University of Missouri, *Jeffrey & Drouet 1044*, Aug. 28; cornfield by Highway 63 west of Sturgeon, *Drouet 1093*, Sept. 3; by Black's Mill Road south of Columbia, *Jeffrey & Drouet 1155*, Sept. 15; waste ground east of the Stadium, Columbia, *Drouet 1181*, Sept. 20, 1933.

Onosmodium subsetosum Mack. & Bush. Including *O. molle* of the Columbia *Floras*. The specimens previously referred to *O. molle* are broken off just below the lowest branches, so that the character of the stems was not known. The nutlets, however, are those of *O. subsetosum*.

*Cunila origanoides (L.) Britton. Rocky woods north of Claysville, *Drouet 1232*, Sept. 30, 1933.

Hedeoma hispida Pursh. Widely distributed in the region, especially in old fields and barrens.

Mentha arvensis L. var. glabrata (Benth.) Fernald. Including *M. piperita* of Rickett's *Flora*.

Scutellaria ambigua Nutt. *S. parvula* Michx. var. *ambigua* (Nutt.) Fernald. Including *S. parvula* of Daniels, and of Rickett in part. Two sheets are retained in S. parvula Michx.: *Daniels*, June, 1897, as *S. campestris*, and *Rickett*, June, 1926. See Contrib. U. S. Nat. Herb. **22**(10): 729. 1927.

Physalis subglabrata Mack. & Bush. Collected in many localities in the Columbia region. One specimen from Rocheport, *Rickett*, July 23, 1927, is placed here.

Martynia louisiana Mill. University Orchard, Columbia, *C. G. Schmitt*, Sept. 1, 1933.

*Plantago elongata Pursh. *P. pusilla* Nutt. Moist loess banks near the salt lick one mile north of Highway 40 just west of the M. K. & T. railroad bridge, Howard Co., *Drouet 434*, May 30, 1933.

Houstonia angustifolia Michx. Hillsides along Bonne Femme Creek south of Pierpont, *Jeffrey*, June 14, *Drouet 542*, June 24, 1933.

Dipsacus sylvestris Huds. Swampy ground by Mill Creek near Highway KK, *Jeffrey & Drouet 1043*, Aug. 24, 1933.

Lobelia Cardinalis L. Low ground by Cedar Creek two miles southeast of Selby (Barnes Chapel), *A. A. Jeffrey & Drouet 955*, Aug. 12; in a willow thicket below the sandstone bluffs of Hinkson Creek, *Drouet 1100*, Sept. 6, 1933.

Ambrosia psilostachya DC. Railroad embankments near the M. K. & T. Station, Columbia, *Drouet 1195*, Sept. 22, 1933. See Rickett's *Flora*, p. 72, and Rhodora **35**: 361, footnote.

*Artemisia ludoviciana Nutt. var. Lindheimeriana (Scheele) Bush, Amer. Midl. Nat. **11**: 35. 1928. Spreading in fence-rows and in wild places, open woods in the southwest corner of Columbia Cemetery, *Drouet 1122*, Sept. 9, 1933.

*Aster patens Ait. By the Claysville Road south of Highway 63, Boone Co., *Jeffrey 356*, loess woods north of Hartsburg, *Drouet 1227*, Sept. 30, 1933.

*Boltonia latisquama Gray. Prairie by Highway 63 west of Sturgeon, *Drouet 1094*, Sept. 3; low ground by the railroad north of Browns Station, *Drouet 1167*, Sept. 16, 1933.

*Centaurea maculosa Lam. Established in an old field north of Hartsburg, *Drouet 1228a*, Sept. 30, 1933.

Centaurea vochinensis Bernh. Established in Sanborn Field, Columbia, *Jeffrey 239*, Sept. 4, 1933.

Coreopsis tripteris L. var. Deamii Standley, Rhodora **32**: 33. 1930. Abundant in low ground west of Browns Station, *Drouet 878*, Aug. 2, 1933. An old specimen, "Columbia, Mo.," *Daniels*, July, Aug., 1897, consisting of an inflorescence and upper cauline leaf, was recently discovered (see Rickett's *Flora*, p. 75) and may possibly be referred to the typical variety.

Erechtites hieracifolia (L.) Raf. var. intermedia Fernald, Rhodora **19**: 27. 1917. *E. hieracifolia* of Gray's Manual, 7th ed., in part, not Raf. *E. hieracifolia* of the Columbia *Floras*.

Eupatorium coelestinum L. Established on ballast along Stewart Road east of Garth Ave., Columbia, *Steyermark & Drouet 1058*, Sept. 2, 1933. See Rickett's *Flora*, p. 76.

Grindelia serrulata Rydb., Man. Fl. Prairies & Plains, p. 784. 1932. *G. squarrosa* of Rickett's *Flora*. "Agriculture Experimental Field," *Rickett*, June 28, 1928; pasture, 600 High St., Columbia, *Jeffrey 100*, Aug. 5, 1933.

Kuhnia eupatorioides L. and the var. corymbulosa T. & G. *K. suaveolens* of Drouet, Rhodora **35**: 364.

Lactuca canadensis L. Including *L. sagittifolia* of the Columbia *Floras* and *L. integrifolia* Bigel. The four varieties (Rhodora **22**: 9–11. 1920) are apparently widespread: var. typica Wiegand, e. g., *Drouet 597;* var. latifolia O. Kuntze, e. g., County Road Prairie, *Rickett*, July 27, 1930; var. integrifolia (Bigel.) Gray, e. g., roadsides, *Daniels*, July, 1903; and var. obovata Wiegand, e. g., *Drouet 923*.

Polymnia Uvedalia L. var. genuina Blake, Rhodora **19**: 46–48. 1917. Low woods near Roby's Spring, southeast of Rocheport, *Jeffrey & Drouet 1110*, Sept. 8, 1933. See Rickett's *Flora*, p. 79. Our plants have branches of the inflorescence copiously hispid-pilose, but the many glands are stipitate.

Prenanthes crepidinea Michx. In woods by Perche Creek south of Highway 40, *A. A. Jeffrey & Drouet 1184*, Sept. 21, 1933.

Rudbeckia hirta L. Including *R. fulgida* of Drouet, Rhodora **35**: 364.

Rudbeckia subtomentosa Pursh. Collected in low ground throughout the Columbia region. See Rhodora **35**: 364 and Rickett's *Flora*, p. 79.

Solidago canadensis L. var. gilvocanescens Rydb. Much of *S. altissima* of Rickett's *Flora*.

*Solidago glaberrima Martens. *S. missouriensis* Nutt. In the County Road Prairie, Callaway Co., *Jeffrey & Drouet 817*, July 30, 1933; roadside east of Deer Park, *Jeffrey & Drouet 945*, Aug. 12, 1933.

*Solidago gymnospermoides (Greene) Fernald. By the railroad north of Hallsville, *Jeffrey 305*, Sept. 16; by Highway 63 north of Hinton, *Drouet 1205*, Sept. 23; old field by Richland Road east of Columbia, *Jeffrey 337*, *Drouet 1217*, Sept. 27, 1933. The plants from near Hinton have smaller involucres, as Friesner describes for his *S. remota*, Butler Univ. Stud. **3**(1): 63. 1933.

*Solidago petiolaris Ait. var. Wardii (Britton) Fernald. Open rocky woods north of Claysville, Boone Co., *Drouet 1228*, Sept. 30, 1933.

Solidago rigida L. Along railroad north of Hallsville, *Jeffrey 304*, *Drouet 1170*, Sept. 16, 1933.

Xanthium chinense Mill. *X. canadense* of the Columbia *Floras*, not Mill.

Xanthium pennsylvanicum Wallr. *X. canadense of* Gray's Manual, 7th ed., in part. Collected at several stations within the region.

Department of Botany, University of Missouri.

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CRITICAL PLANTS OF THE UPPER GREAT LAKES REGION OF ONTARIO AND MICHIGAN

M. L. Fernald

(Plates 352–379)

Part I. The Pre-Wisconsin Flora of the Upper Great Lakes Region[1]

Ever since I learned through the distinguished student of the Pleistocene, Professor A. P. Coleman of the Royal Ontario Museum, that "Some suggestions have been made that parts of the north shore of Lake Superior and other high points on the Upper Lakes show little glaciation. On the Slate Islands [only station between the Rocky Mts. and Gaspé for *Dryas Drummondii*] some years ago I was surprised to find no evidence of glaciation"[2]; ever since Professor Coleman wrote these pregnant words I have yearned to see some of the country bordering the Upper Great Lakes. As a field-botanist, realizing the complete disagreement of the botanical evidence, of relic-colonies of remotely isolated or strictly endemic plants about the Great Lakes, and the current interpretation of many geologists, that the flora of the region has been completely wiped out by a wholesale very recent continental glaciation, the "suggestions" referred to by Coleman and his surprise "to find no evidence of glaciation" on the

[1] The substance of Part I was presented to the Royal Canadian Institute at Toronto on January 26 and to the New England Botanical Club at Boston on April 5.

[2] Coleman as quoted in Fernald, *Some Relationships of the Floras of the Northern Hemisphere*, Proc. Internat. Congr. Pl. Sci. ii. 1507 (1929).

Slate Islands in Lake Superior appealed to me. They were what I, as a botanist knowing something of the evidence supplied by the flora, would expect. However, except for the broad-visioned Coleman and one or two others, I could draw from most geologists no admission that any portions of the Upper Great Lakes region could

Map 1. Availability for Occupation by Plants of North American Areas since the Paleozoic (*Map by* Alfred W. Lott).

possibly have passed unscathed through any of the several advances of the Pleistocene ice. The most extensive correlation of the plant-dispersal and geological history of that region is the detailed report of my friend, Gleason, on the *Vegetational History of the Middle West.*[1] There the orthodox interpretation is clearly stated, "the Wisconsin glaciers, which . . . flowed in a southwesterly direction into

[1] Gleason, Ann. Assoc. Am. Geogr. xii. 39–85 (1923).

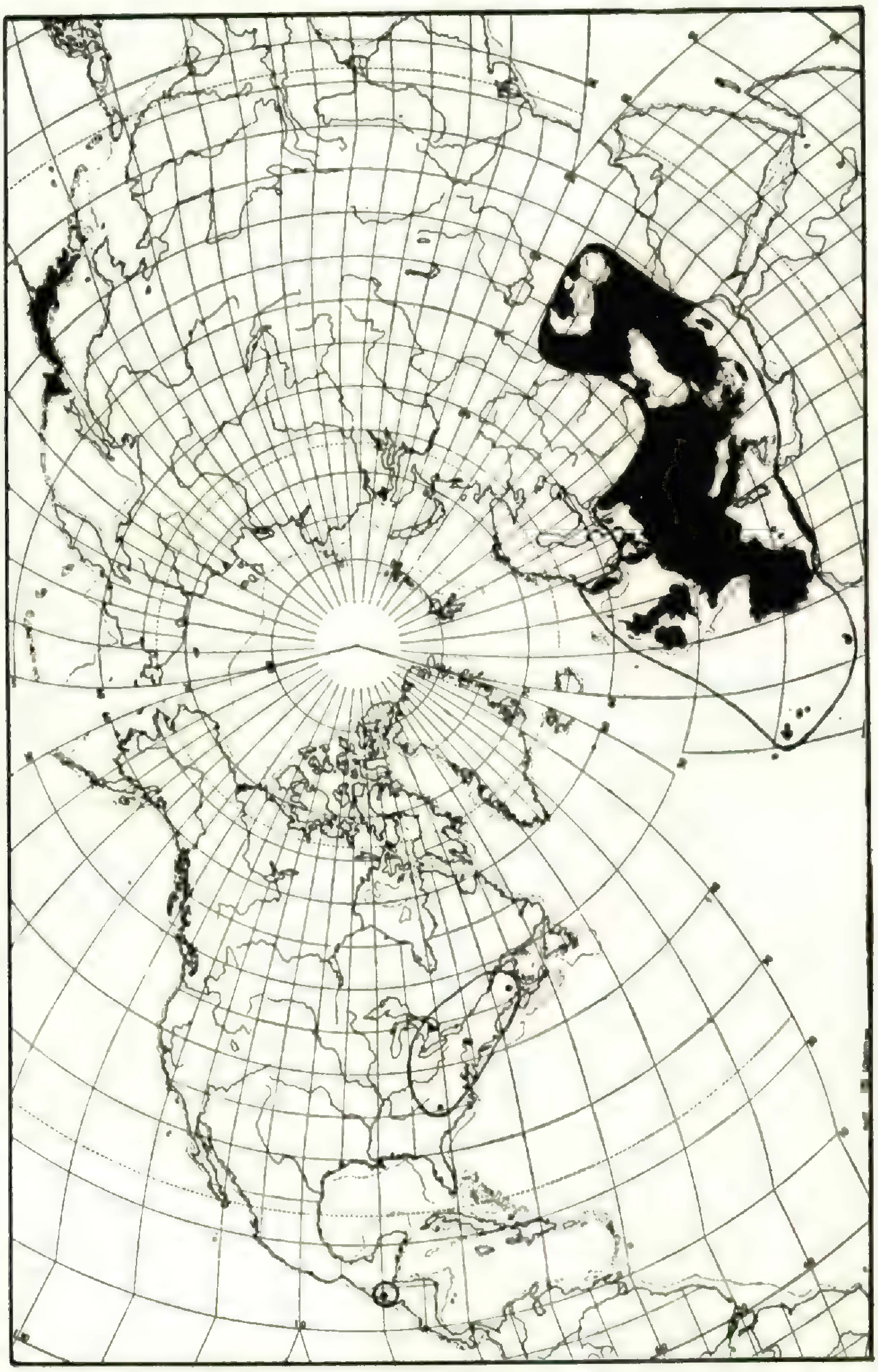
our area, wholly covering the state of Michigan."[1] The elements of the vegetation of the Middle West (including Michigan, where the author had long lived and studied) were enumerated: "THE FIVE ELEMENTS IN THE FLORA OF THE MIDDLE WEST.—. . . .the vegetation of the Middle West . . . is found to be composed of five elements, not of equal importance, centering respectively in the southern Appalachian Mountains, in the southern Coastal Plain and the Mississippi Embayment, in the Ozark Mountains, in the plains of Kansas and Nebraska, and in Canada east of the Great Lakes."[2] Gleason seems not then to have considered (or recognized) the one element which most appeals to my heretical mind as indicating that not all of Michigan was "wholly covered" by Wisconsin ice. I refer to the numerically small but historically significant species of the Pacific slope or the Cordillera which are isolated about the Upper Great Lakes (see MAPS 6–14, 17–20).

The need of much fuller collections of critical plants and a better knowledge of the critical areas in the terrain bordering the Upper Great Lakes was apparent. Consequently, when my enthusiastic (*pulsating* they would say) friends, Pease and Bean (A. S. Pease and R. C. Bean), asked me to recommend a good region for botanical exploration, I suggested the almost inaccessible (except by private boat) portions of the high north shore of Lake Superior and also the Slate Islands. In the summer of 1933 they made successful explorations at various points, centering on Jack Fish and Schreiber, and made a partial survey of the Slate Islands. A full series of the collections of Pease and Bean was most generously deposited in the Gray Herbarium, some species easily identified; others, not so simple, set aside for intensive study, species not heretofore recognized as growing near the Great Lakes.

In June, 1934, it was my great privilege to supply, along with Professor Coleman, the lecture-programme of the Botanical Society of America, meeting at Toronto and then going by automobile to the unique Bruce Peninsula. The latter region, long famous for its several relic-species (*Phyllitis Scolopendrium* (MAP 2), *Polystichum Lonchitis* (MAP 3), *Asplenium cryptolepis* (MAP 5), *Sagittaria cristata, Melica Smithii* (MAP 11), *Festuca occidentalis, Habenaria unalascensis, Goodyera decipiens, Draba lanceolata, Drosera linearis, Rubus parviflorus* (MAPS 14–22), *Epilobium leptocarpum* var. *Macounii, E. panicu-*

[1] Gleason, l. c. 62.
[2] Gleason, l. c. 54.

latum, Aster ptarmicoides var. *lutescens, Adenocaulon bicolor* (map 9), etc.), far-isolated from the main areas of the species, was, necessarily in view of the large and diversely interested (and uninterested) party,



Map 2. World-Range of Phyllitis Scolopendrium.

shown us at only a few spots readily accessible to an auto-cavalcade. The botanists of the University of Toronto, notably Professors P. V. Krotkov and Thomas M. C. Taylor and their associates, have for some years been concentrating work on the region; and Dr. Stebbins

of Colgate University recently published[1] his interpretation of the flora and notes on some of the specialties. As to recent glaciation of the Bruce Peninsula and adjacent areas (Grey County, etc.), those of us who had the superlative advantage of riding through the region with Coleman enjoyed his clear exposition, that the lower levels were in many areas most certainly invaded by Wisconsin ice and that the comparatively recent terraces of the Great Lakes were there well displayed; but, and this is the significant point, the highest outcrops of the Niagara escarpment there often display the undenuded and deeply rotted features which seem to indicate that the Wisconsin glaciation left them as nunataks (ice-free areas surrounded by glacial fields).

I am aware that to Stebbins "it seems unlikely that these nunataks were large enough to support a Canadian woodland flora."[2] He may be right; none of us were there to see. Nevertheless, it is most difficult to explain the extreme localization of the Hart's Tongue Fern in Bruce, Grey and Durham Counties unless it had some near-by source from which to spread. The species, *Phyllitis Scolopendrium* (L.) Newm. (*Scolopendrium vulgare* Sm.), has a disrupted range (MAP 2) which was achieved before the Pleistocene: the Mediterranean region from Iberia and northern Africa eastward to northern Persia, thence northward into west-central Asia, southern Scandinavia, Scotland and Ireland; the Macronesian Islands; Japan; and 5 very remote and very restricted areas in North America. Our plants are always on limestone or dolomite: a small colony in a ravine of the Meduxnakeag valley in western New Brunswick; a larger colony with a number of restricted stations "on shaded limestone cliffs and depressions in Onondaga and Madison counties," New York; a tiny colony in a cave near the southeast corner of Tennessee; and, 1450 miles further south, in the mountains of tropical Chiapas, an isolated variety. The one extensive area in North America is on the Bruce Peninsula and adjacent outcrops of dolomite in Ontario. There the Hart's Tongue is a rather frequent and locally abundant fern of fissures and depressions of wooded dolomite. So long as the American plants were considered identical with the European there lingered the possible interpretation that they had been recently brought from Europe and had found a few favorable habitats in which they could spread. Close examination of the American plants shows, however, that they differ in some very essential characters not found in the European plants.

[1] Stebbins, *Some Observations on the Flora of the Bruce Peninsula, Ontario*, RHODORA, xxxvii. 63–74 (1935).

[2] Stebbins, l. c. 69 (footnote).

In the more detailed sections of this paper I am treating them as two geographic varieties (PLATE 355), although the differences are such that some students may prefer to consider them as distinct species. Now, if the strictly North American variety of *Phyllitis Scolopendrium* reached the Bruce Peninsula region in post-Wisconsin time, whence did it come? The New Brunswick and New York stations are all within the area which we are taught to believe was overridden by Wisconsin ice and therefore present the same problem; and the Tennessee station is very tiny, deeply hidden and remote. If the American *Phyllitis Scolopendrium* has been migrating about New Brunswick, Ontario and New York since the Wisconsin (in present time) why have its abundant spores failed to make successful landings on hundreds of thousands of acres of equally available limestones and dolomites in eastern Canada and the northern States? In Bruce, Grey and Durham Counties the fern would rank as frequent and locally abundant and it there grows in the Alleghenian forest with species which abound all over Alleghenian America. Its isolation of colonies is not consistent with post-Wisconsin migration; it seems to me to be a pre-Wisconsin relic, belonging with the other relics to be discussed below.

Dr. Pease was so gratified by the success of himself and Bean in discovering puzzling plants or in extending ranges on the north shore of Lake Superior that he invited me to join him, after the Toronto meeting, for a brief trip to the south shore of Lake Superior, in Michigan. Accordingly, on June 27, I met him and my son, Henry G. Fernald, who accompanied us as alternate driver, photographer and general helper, at North Bay on Lake Nipissing. From there we drove, stopping when inviting territory was found or when some unrecognized plant was seen, by the regular automobile route through "the Soo" (Sault Ste. Marie), thence by the conventional route across the Upper Peninsula as far as the road would take us, nearly to Keweenaw Point. Our brief stops were numerous; but two areas received more attention than others: Cloche Peninsula and Great Cloche Island, on the north shore of Lake Huron, where we spent one very crowded day (with a brief but rather unproductive invasion of much burned Manitoulin Island[1]); and Keweenaw County, the still gratifyingly wild and natural (except for old mines) tip of the Keweenaw Peninsula, where we had nearly four full days of absorbing botanizing. Much more time could have been advantageously given to the region

[1] See Fassett, RHODORA, xxxv. 389 (1933).

but appointments at home forced us to leave many promising spots unvisited.

This necessary restriction of the time at our disposal forced us to forego the great pleasure it would have been to have accepted the invitations we had received from botanical associates in various parts of Michigan to visit them. If we had used our limited four days in journeys to Lansing, Detroit, Ann Arbor and Douglas Lake, we should never have reached our primary objective, Keweenaw County. It is a real disappointment now to learn that, without swerving from our rigid programme, we might, after all, have combined our Keweenaw trip with a visit to one of the pioneer botanists of that region, Oliver Atkins Farwell, who, quite unknown to us at the time, has returned to the Peninsula (at Lake Linden) and has there renewed[1] his botanical explorations which began in the 80's.

From our non-geological and foreign viewpoint it was difficult for us to see that *everywhere* through this region late Pleistocene activity had been so universal or so uniform as we had been led by many geologists to believe; or that the reputed wholesale and very recent submergence of the land under the lake-water had everywhere left visible evidences. In some areas, for instance much of the region north of Lake Huron, the denudation of the hills (PLATE 353) has been complete. In such tediously uniform country, with the vegetation consisting only of ubiquitous and rapidly invading or aggressive modern species (*Pteridium latiusculum, Athyrium angustum, Osmunda Claytoniana, Pinus Banksiana* and *resinosa, Panicum linearifolium, Oryzopsis pungens, Deschampsia flexuosa, Calamagrostis canadensis, Glyceria striata, Carex aenea, Crawfordii, gracillima, leptonervia, flava* and *arctata, Iris versicolor, Salix humilis, Populus tremuloides,* etc.), there was no temptation to linger. When we conscientiously tested such areas, which experience had long ago taught us were "no good," we came back empty-handed or, to save our faces and not be defeated, with a specimen or two "for locality."

In other sections, like portions of the Cloche Peninsula, some areas were thoroughly denuded, others had the ledges of greenstone, quartzite or limestone covered with a frost-broken mantle of unremoved debris *in situ*. In such a place botanizing, as always in spots of weathered rock, was productive: *Festuca occidentalis, Carex concinna, Habenaria unalascensis, Salix serissima, Polygonum Douglasii, Geum triflorum, Astragalus neglectus, Lathyrus ochroleucus, Epilobium*

[1] See Farwell, RHODORA, xxxvii. 164 (1935).

paniculatum, Coreopsis lanceolata, etc. The lowermost levels of Cloche Peninsula and of Great Cloche Island are very flat and, obviously, only recently emerged from the Lake. Their scoured and washed surface is a limestone pavement, often of a beautifully regular cancellate pattern. On this flat limestone pavement of the lakeside or in marshy depressions and savannahs upon it the widely dispersed calcicolous flora of the Great Lakes region luxuriates: *Equisetum variegatum, Agropyron trachycaulum, Eleocharis compressa, Carex Garberi* (described in this paper), *eburnea, Crawei,* etc., *Juncus balticus* var. *littoralis, J alpinus* vars., *Tofieldia glutinosa, Allium Schoenoprasum* var. *sibiricum, Comandra Richardsiana, Arenaria stricta, Potentilla fruticosa* and *Anserina, Polygala Senega, Rhus canadensis, Hypericum Kalmianum, Viola nephrophylla, Shepherdia canadensis, Satureja glabra, Castilleja coccinea, Lobelia Kalmii,* etc.

Similarly, on the Keweenaw Peninsula evidences of extensive and profound work by glaciers were obvious at many low levels; but at the higher levels, such as West Bluff (PLATE 352), 735 feet (224 m.) above Lake Superior, where the deeply weathered trap and conglomerate cliffs stand well above the levels of evident glacial till and denudation, subaerial decay and weathering have obliterated any apparent traces of glaciation, if there ever were any. The day we visited West Bluff (July 4th) the wind blew strongly up the face of the Bluff, which stands surrounded by a vast area of continuous forest. So rotted was the material of which it is composed that we were forced to fight our way against clouds of wind-blown sand and dust of purely local origin. In many areas of unquestioned Wisconsin glaciation which I have visited in New England and eastern Canada the conglomerates have not reached this state of decay, although they are in a region of quite as severe climate as that of northern Michigan. One would suppose that the thousands (probably hundreds of thousands) of years which have elapsed since the subaerial disintegration of West Bluff began should have sufficed to blow away all the dust, but every visitor there, when the wind sweeps up the Bluff, still gets his full "peck of dirt." Such a condition is not consistent with Wisconsin denudation as we understand it farther east.

Likewise, on the crests of more sheltered woodland bluffs and low ridges at elevations of 500 feet (150 m.) or even less above Lake Superior, such, for instance, as those on the north side of the "Mountain Drive" between West Bluff and Eagle Harbor, the angular and slow-weathering debris (PLATE 354), which forms the undisturbed mantle

(just as if it were in the unglaciated southern Alleghenies), is striking evidence to a botanist, at least, that, while a late Pleistocene glaciation rendered botanically uninteresting such country as that shown in PLATE 353, it did not destroy the ancient vegetation on the higher areas (PLATES 352 and 354) of Keweenaw County. In fact, it seemed to us that the later glaciers, just as in eastern Canada, New York and New England,[1] had worked only on the lower levels; and on the Keweenaw Peninsula, as well as in Quebec, the Maritime Provinces and New England, precipitous bluffs and high ridges must have diverted the ice-flow, just as they can be seen to do today in many regions where continental glaciations still prevail.

It is significant, then, that Keweenaw County has a greater assemblage of remotely isolated relic-species and isolated endemics than any other botanically explored region between the Gaspé cliffs and mountains and The Driftless Area of Wisconsin, Minnesota, Iowa and Illinois. Here occur, usually isolated by many hundreds of miles and often by more than a thousand, colonies of such species as *Woodsia oregana, Polystichum Lonchitis* (MAP 3), *Asplenium montanum* (MAP 4), *A. cryptolepis* (MAP 5), the Rocky Mountain *Pteridium* (to be discussed later, known between the mountains of Quebec and the Black Hills only on the Bruce Peninsula and in northern Michigan), *Melica* (or *Bromelica*) *Smithii* (MAP 11), *Festuca occidentalis, Corallorrhiza striata,* an endemic variety of *Chamaerhodos Nuttallii* (MAP 10) of the Rocky Mountains and the Great Plains, *Crataegus Douglasii, Potentilla Blaschkiana,*[2] *Rosa Lunellii,*[2] *Ceanothus sanguineus* (MAP 6), *Chimaphila umbellata* var. *occidentalis, Vaccinium membranaceum* (MAP 7) and *ovalifolium, Collinsia parviflora, Adenocaulon bicolor* (MAP 9), an undescribed *Arnica* of the cordilleran series *Cordifoliae* and several others.

To some, who are unable to visualize the Pleistocene glaciation in the region from Newfoundland to the Great Lakes as NO MORE SEVERE THAN THAT WHICH NOW COVERS GREENLAND, WHERE AN EXTENSIVE TEMPERATE FLORA NOW OCCURS AT THE ICE-FREE MARGIN OF THE CONTINENTAL ICE-CAP, it apparently seems impossible that life could have persisted in the lower latitude of the Great Lakes region through the Pleistocene. It should not be overlooked, however, that the flora of approximately 400 species of vascular plants, which today grows on the ice-free areas of Greenland, is at the margin of a continental

[1] Extended discussion of this feature of New England and adjacent area will appear elsewhere.

[2] See Farwell, l. c.

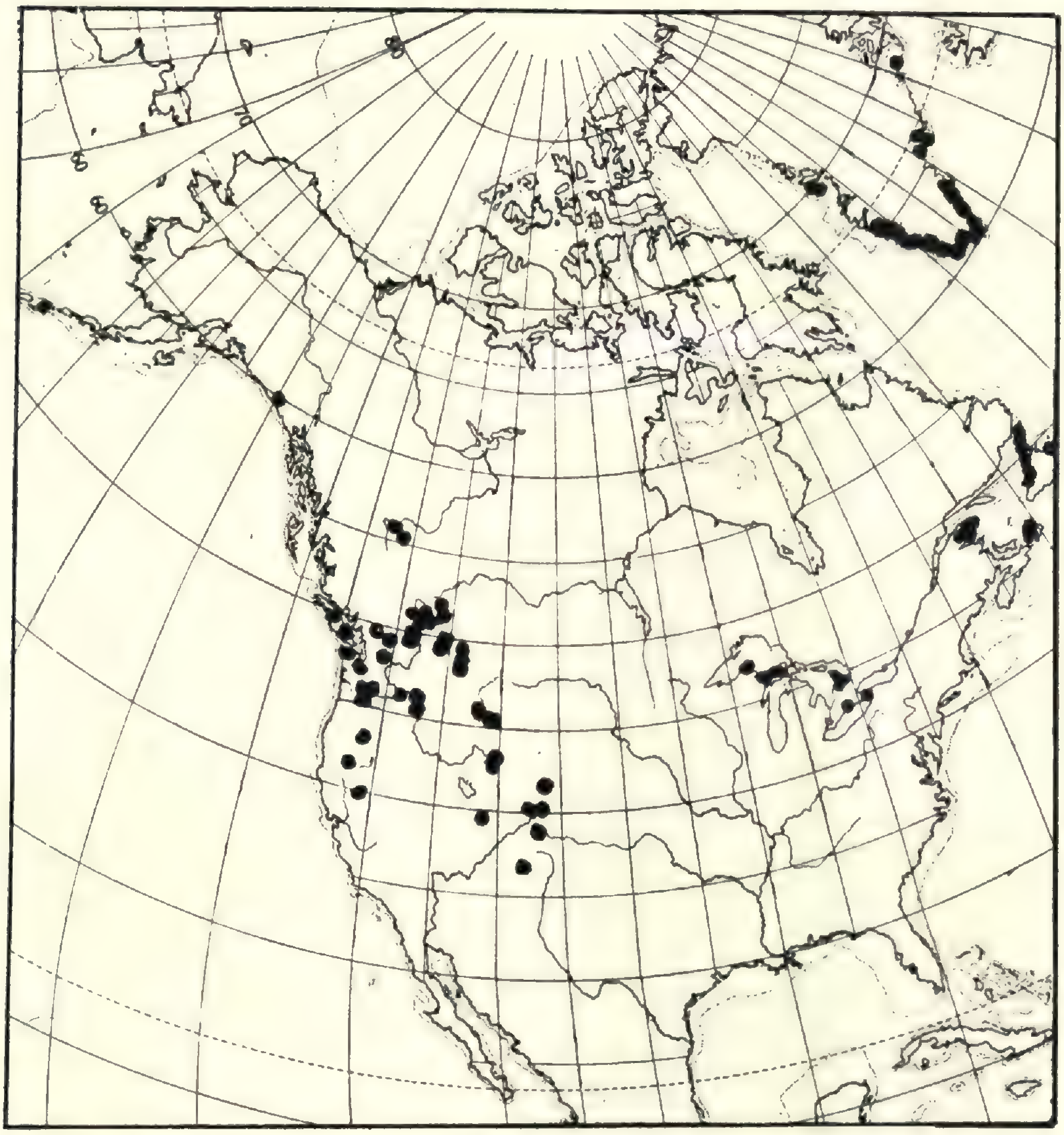
glacier which is often said to be as extensive as any which formerly occupied the median latitudes of North America. It should further be noted that, of the whole vascular flora of Greenland essentially one-third (131) of the species likewise grow as usually common plants in Michigan, Wisconsin, Minnesota or adjacent Ontario. This large (surprisingly large to those who have not previously realized it) group of temperate species, which in Greenland are not seriously disturbed by the proximity of a continental glaciation, includes such very familiar plants as *Woodsia ilvensis*, *Cystopteris fragilis*, *Thelypteris Phegopteris* and *Dryopteris*, *Equisetum arvense* and *sylvaticum*, *Lycopodium annotinum*, *clavatum* and *complanatum*, *Sparganium angustifolium*, *Potamogeton pusillus*, *gramineus* and *filiformis*, *Triglochin palustris*, *Trisetum spicatum*, *Deschampsia flexuosa*, *Eriophorum angustifolium*, *Carex brunnescens*, *canescens*, *deflexa* and *capillaris*, *Juncus bufonius* and *filiformis*, *Tofieldia minima*, *Habenaria hyperborea*, *Listera cordata*, *Corallorrhiza trifida*, *Alnus crispa*, *Arenaria lateriflora*, *Stellaria borealis*, *Ranunculus reptans* and *trichophyllus*, *Coptis groenlandica*, *Drosera rotundifolia*, *Potentilla palustris* and *tridentata*, *Viola Selkirkii*, *Epilobium angustifolium* and *palustre*, *Circaea alpina*, *Hippuris vulgaris*, *Cornus canadensis*, *Pyrola secunda*, *Ledum groenlandicum*, *Andromeda glaucophylla*, *Arctostaphylos Uva-Ursi*, *Vaccinium Oxycoccus*, *Menyanthes trifoliata*, *Utricularia intermedia*, *Galium triflorum* and *Linnaea borealis* var. *americana*. These are all plants which in much of temperate North America are looked upon as the dominant and progressive or rather ubiquitous species, plants which freely pioneer and readily take possession of newly available land. They have rapidly covered much of the territory which was under Wisconsin ice. They are not, therefore, in the same class as the next element of the living Greenland flora to be considered.

This is a more conservative group of species which shares Greenland with the Great Lakes area and other, usually scattered, regions of the Northern Hemisphere. In the Great Lakes region, as in most regions, they are localized or rare species, usually seeming like pre-Wisconsin relics there. They are mostly not pioneers today, but veterans. This list of conservatives contains the following: *Botrychium Lunaria* (K),[1] *Thelypteris Filix-mas* (K) and *fragrans* (K), *Polystichum Lonchitis*, MAP 3 (K), *Lycopodium Selago* (K), *Selaginella selaginoides* (K), *Phleum alpinum* (K), *Poa alpina* (K), *Carex Vahlii* (K) and *scirpoidea*

[1] The species of Greenland which occur as localized plants in Keweenaw County are indicated: (K).

(K), *Orchis rotundifolia, Polygonum viviparum* (K), *Stellaria longipes, Sagina nodosa* (K), *Ranunculus lapponicus, Braya humilis* (K), *Draba incana* (K), *Arabis Holboellii* (K), *Saxifraga aizoides, Aizoon* (K), and *tricuspidata* (K), *Pinguicula vulgaris* (K) and *Artemisia borealis* (K).

Such a very distinct and widely dispersed (ancient) but everywhere local fern as *Polystichum Lonchitis* (MAP 3), easily spread by wind-

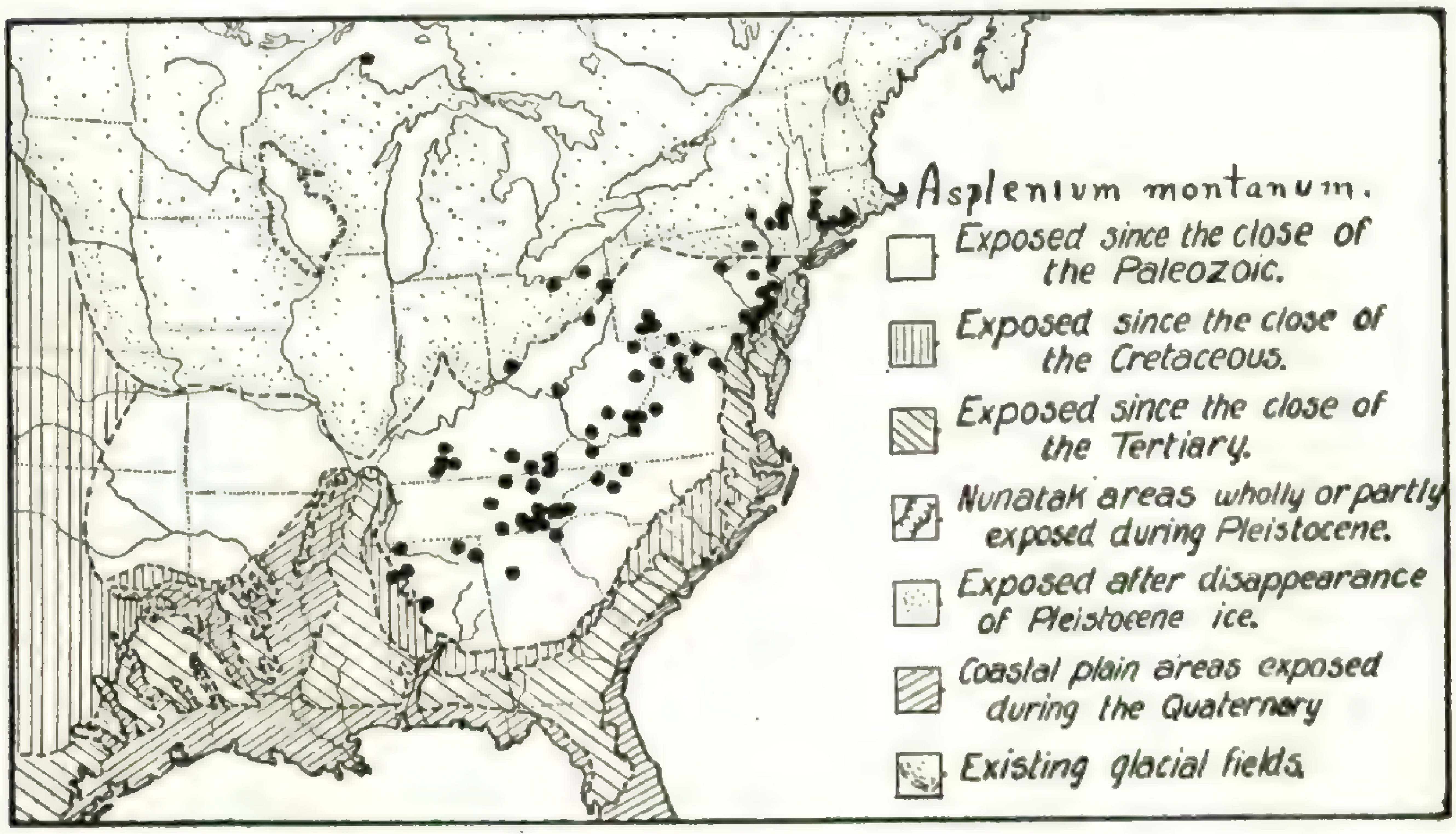


MAP 3. North American Range of POLYSTICHUM LONCHITIS.

borne spores but absent (presumably exterminated by glaciations, increased aridity and other depleting agencies) from large areas within its broad belt of distribution, occurs in Keweenaw County in the richest of deciduous woods, under the shade of ancient Alleghenian trees (like *Juglans cinerea* and *Tilia americana*) with *Adenocaulon bicolor* (MAP 9), of the *Sequoia* forests of the Pacific slope and of cold

ravines in the Black Hills, and *Melica Smithii* (MAP 11), also of the Pacific slope and of the Black Hills, sharing the woodland humus close-by. To me it seems quite illogical to argue that such species and the many other conservative and now unaggressive species with them have been arriving in post-Wisconsin times from different remote centers outside the area of general Pleistocene glaciation, like the Black Hills, 550 miles southwest of Lake Superior and available for plant-occupation since the Cretaceous (see MAP 1), or like the Snake River valley of Idaho, more than 1000 miles to the west and available for plant-occupation since the Jurassic. And it seems especially indefensible to maintain that such plants, coming from unglaciated or only anciently glaciated areas north, south, east and west, should fortuitously have all found the tip of Keweenaw Peninsula (or similarly isolated spots) in post-Wisconsin and should there have started successful colonies, without leaving in their long hypothetical cross-country journeys a somewhat continuous train of intermediate stations.

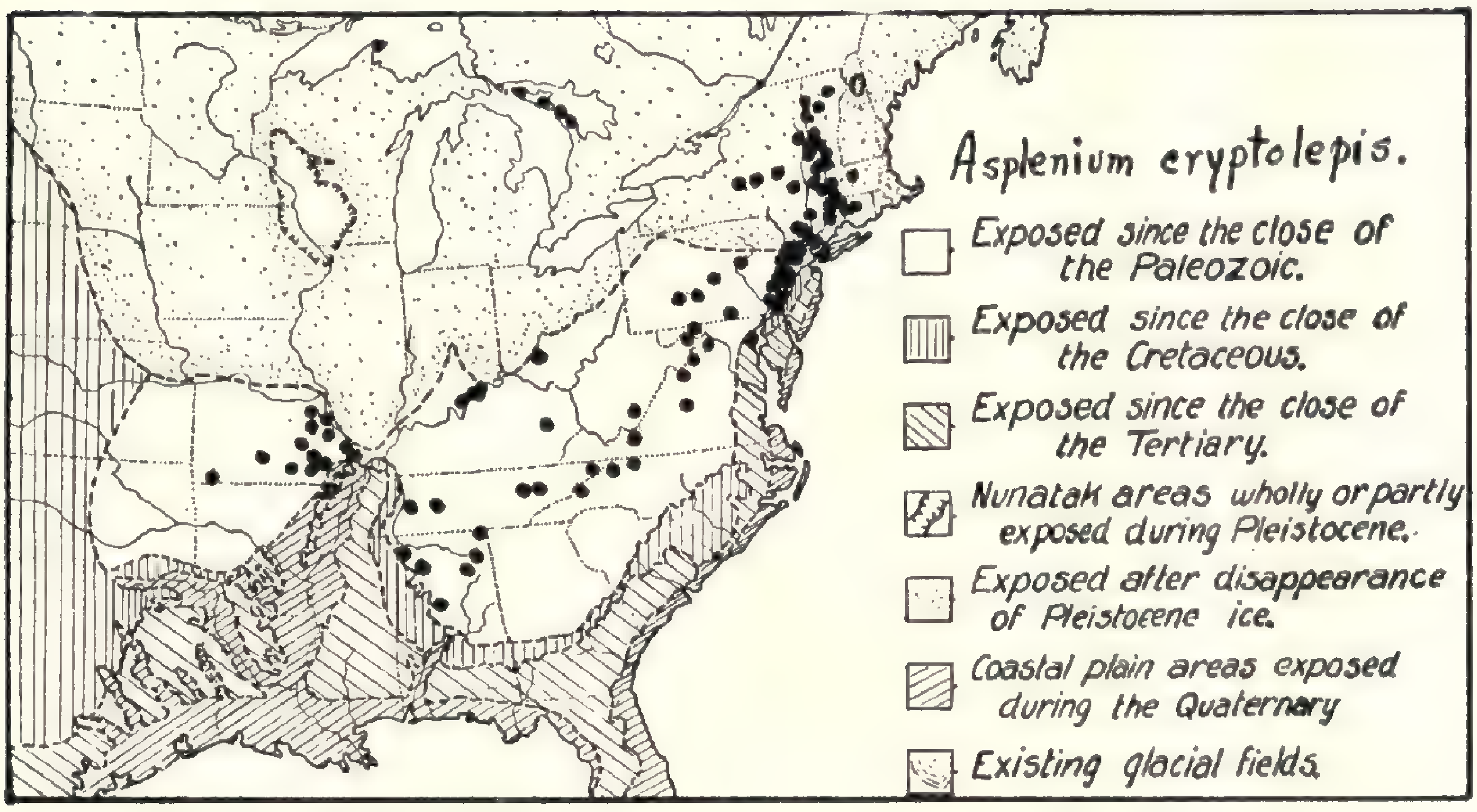
There is nothing particularly unique about the soils of Keweenaw County. Varying from sandstone and greenstones to silicious or to calcareous conglomerate, with frequent iron- or copper-deposits, they



MAP 4. Range of ASPLENIUM MONTANUM.

offer a fair average of diversified soils. Surely, the wind-dispersed spores of *Asplenium montanum* (MAP 4), a species of neutral to acid rock, must, during the last 30,000 years, have fallen somewhere, except locally in Ohio, between the ancient Appalachian core of the

continent and the tip of this remote Peninsula; but not one of the host of ever-enthusiastic hunters for ferns has succeeded in finding an intermediate colony north of Lake Erie. Surely, *Asplenium cryptolepis* (MAP 5), an inhabitant of limestone crevices, must scatter spores on the winds every summer. Why does it shun or fail to start on the limestones between southern Ohio and central New York on one edge of its range and the Bruce Peninsula region and Keeweenaw on the

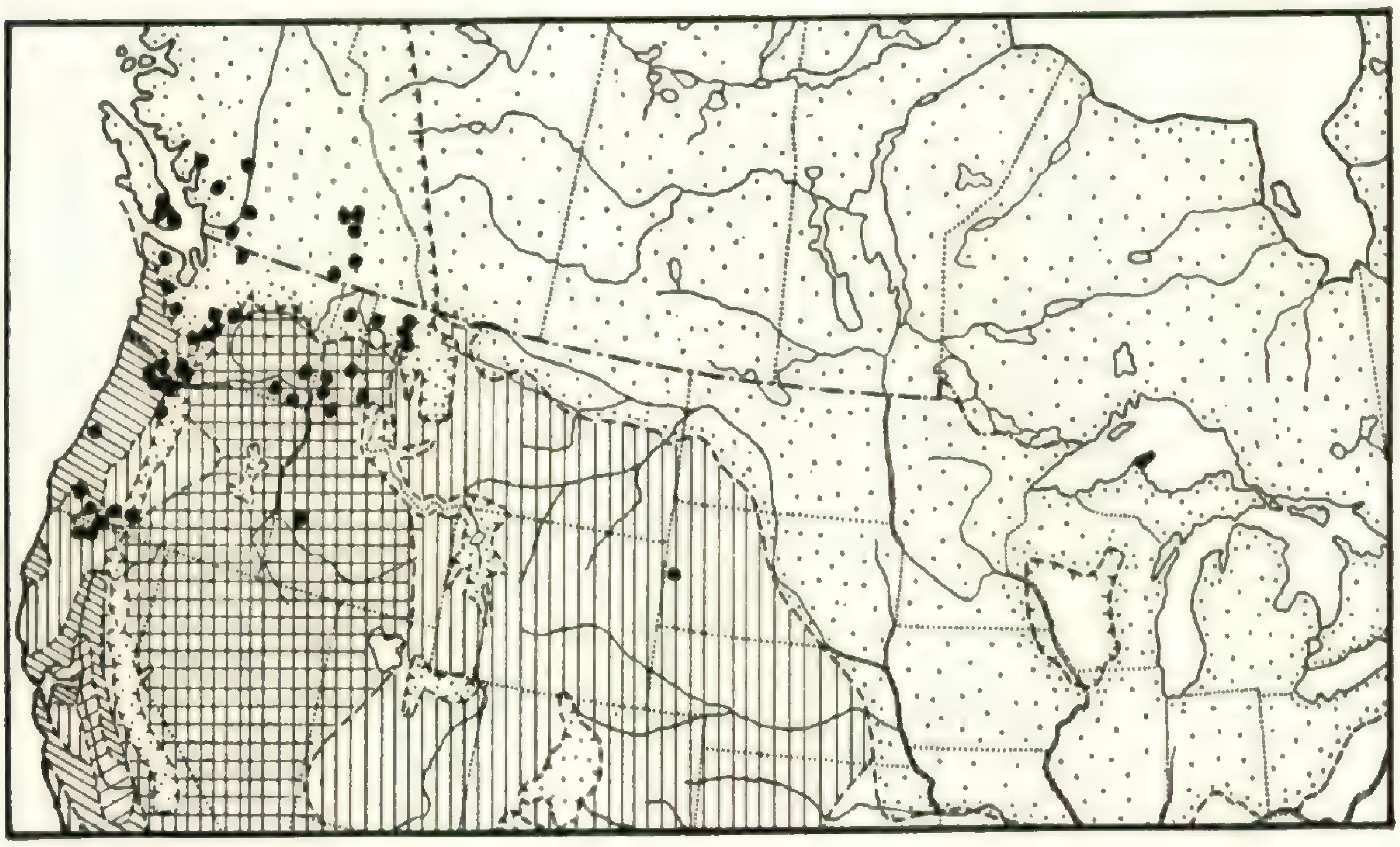


MAP 5. Range of ASPLENIUM CRYPTOLEPIS.

other? There are plenty of limestones in the broad interval but *Asplenium cryptolepis* has not been taking possession of them!

Surely, *Ceanothus sanguineus* (MAP 6), one of the most characteristic large shrubs of the Pacific slope (northern California to Vancouver Island and the Cascades of southern British Columbia, eastward across Idaho into northwestern Montana, with a single record from the Black Hills), if it migrated by means of its heavy, rounded seeds (which roll down- not up-hill) to Keweenaw County in post-Wisconsin time, could have found some dry slope or crest or arid bluff somewhere between western Montana or southwestern South Dakota and the dry bluffs and stony woods (PLATES 352 and 354) of Keewenaw where it grows. It is a tall and handsome shrub, generally known in the Northwest as "Wild Lilac." Why has it not been generally found between western Montana and Keweenaw, if, as some would have us imagine, it has been rolling its large seeds up and over the Rocky Mountains and across the Plains in search of Keweenaw Point in post-Wisconsin time?

Or take *Vaccinium membranaceum* (MAP 7), the "Huckleberry" of the Upper Peninsula of Michigan and especially of Keweenaw. It is there that it is gathered and made into the conserve which reaches the fashionable tables of Great Lakes cities. Having edible berries, it is doubtless locally spread by various animals in northern Michigan. But west of there it is known in typical form (the one in Michigan) only beyond the continental divide. If it is a post-Wisconsin arrival in northern Michigan why, during its imagined migration from west of the Rocky Mountain axis, did it fail to find some place to occupy

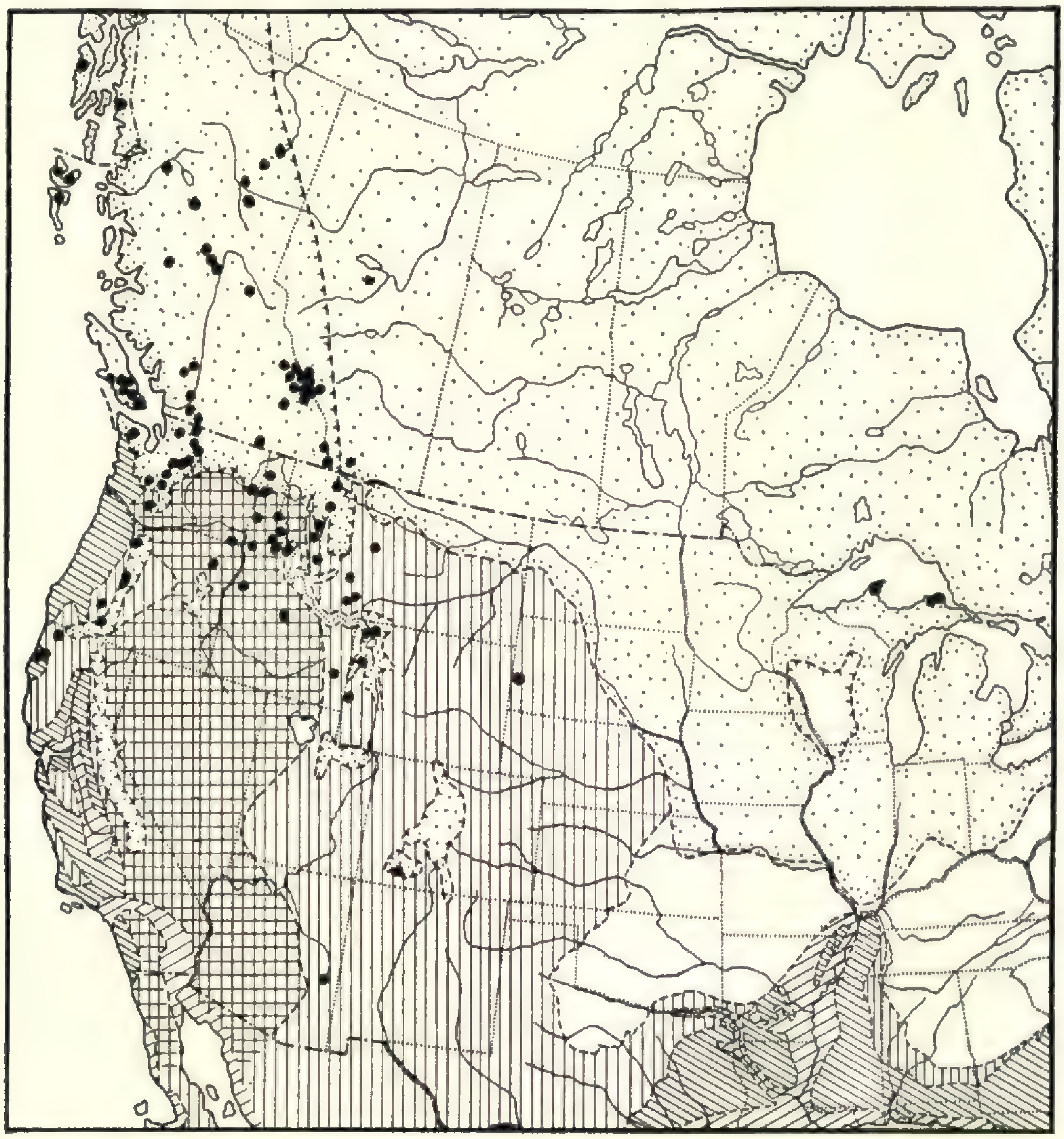


MAP 6. Range of CEANOTHUS SANGUINEUS.

before it reached Lake Superior? It has a xerophytic smaller-leaved variety (sometimes considered a different species, *V. globulare* Rydb.) localized in the Rocky Mountains, south to Arizona; but east of the Rockies and the Black Hills it is quite unknown (and as a shrub bearing edible berries it would be known if present) except on the Upper Peninsula. It there abounds in the dry woods and on slopes of such areas as shown in PLATES 352 and 354.

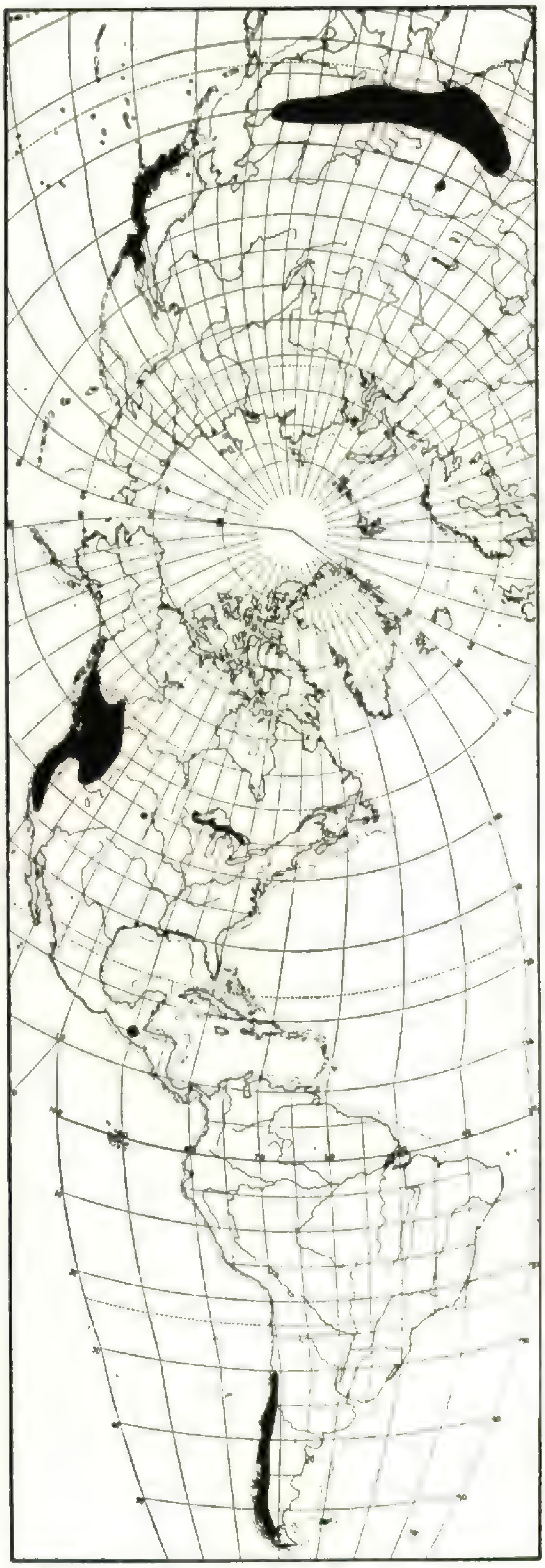
Adenocaulon (MAP 8) is a genus very much older than the Wisconsin glaciation. It has five or six species: *A. adhaerescens* Maxim. and *A. himalaicum* Edgew. of the ancient floras of eastern and south-central Asia; *A. chilense* Lessing, of Chile, and possibly a second Chilean species; a recently discovered species in the mountains of Guatemala (*fide* S. F. Blake); and *A. bicolor* Hook. *Adenocaulon bicolor* (MAP 9), the North American representative of this ancient genus, has three

areas: from California to southern British Columbia, eastward to northwestern Montana; valleys of the Black Hills; and from northern Minnesota to the Bruce Peninsula. It belongs in a family which has many modern weeds; but in a tribe (*Inuleae*) which has a remarkable



MAP 7. Range of VACCINIUM MEMBRANACEUM; the small-leaved variety (*V. globulare*) in the Rocky Mountains.

percentage of local endemics (species of *Antennaria, Leontopodium,* etc.). It is most emphatically not a weed. The geographic disruption of the genus indicates that it is comparatively old; and it is certainly significant that many of the Californian labels indicate its habitat there as being frequently under redwoods ("among redwoods," "Mariposa Big Trees," "*Sequoia gigantea* region," "among redwoods"), that Gray, in the *Botany of California,* should have given its habitat



Map 8. Range of the Genus Adenocaulon.

as "Redwoods," and that Greene, in *Flora Franciscana*, should explicitly describe its habitat as "Redwood forests of the Coast Range." It also grows in other forests, but its frequent association with ancient *Sequoia* and its occurrence on the Pacific Slope or in the Black Hills, largely in areas which had their present floras developed in pre-Pleistocene time, indicate that it is a plant of early, rather than of post-Wisconsin dispersal. *Adenocaulon bicolor* has achenes with one of the best adaptations for easy dispersal, glandular processes; nevertheless, it has failed to occupy any of the broad area between northwestern Montana and the Lake Superior-Bruce Peninsula country, except the ancient Black Hills, where Over records it as "rare in moist ravines."

If it be said that *Adenocaulon* requires moist woodland and, therefore, was unable to get a start in the broad areas between the continental divide and the Black Hills, and thence to Lake Superior, it may be pointed out that one of its associates in Pacific Slope-Great Lakes disruption of range, the "Salmon Berry" of the West, the

Photo. H. G. Fernald.

West Bluff, Keweenaw Peninsula.

Photo. H. G. Fernald.

DENUDED HILLS, NEAR WASAPITEI, SUDBURY DISTRICT, ONTARIO

Photo. H. G. Fernald.

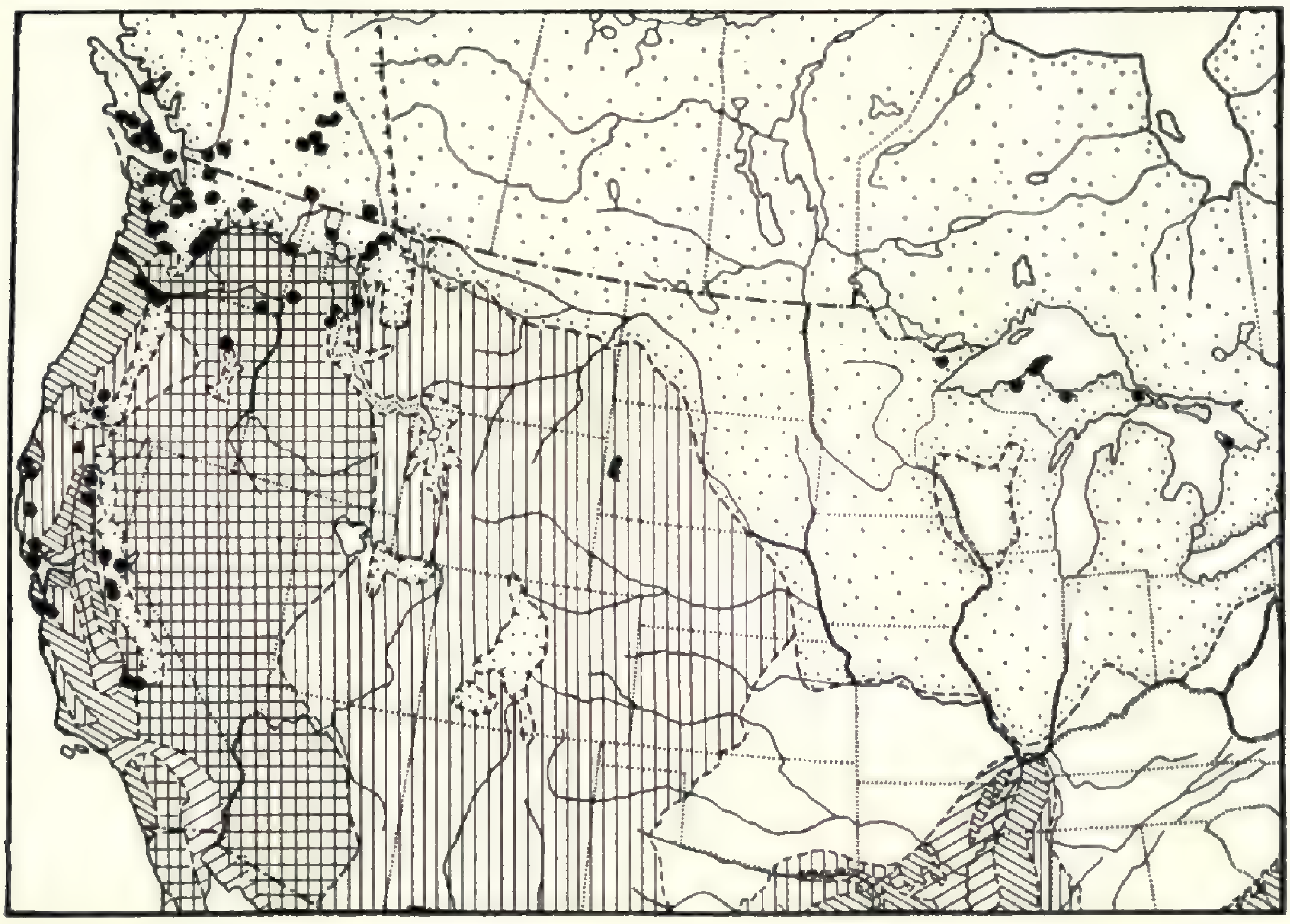
UNDISTURBED MANTLE OF ROTTED ROCK, MOUNTAIN DRIVE, KEWEENAW PENINSULA.

Photo. E. C. Ogden.

Phyllitis Scolopendrium: fig. 1, frond, × ½, from Ireland; fig. 3, scales of stipe, × 10, from Ireland; fig. 5, venation, × 10, from Savoy.

Var. americana: fig. 2, frond, × ½, from New York; fig. 4, scales of stipe, × 10 from Ontario; fig. 6, venation, × 10, from New York.

"Thimble-berry" of Lake Superior, *Rubus parviflorus* (MAPS 14–22, PLATES 363–365), has cordilleran varieties in cool and damp forested cañons all along the Rocky Mountains into Mexico, as well as in the Black Hills. And it certainly cannot be said that *Ceanothus sanguineus*, *Asplenium montanum* and *A. cryptolepis* are intolerant of some aridity; and surely *Chamaerhodos Nuttallii* (MAP 10, PLATE 366), which occupies the arid and windswept crests, crevices and talus of West

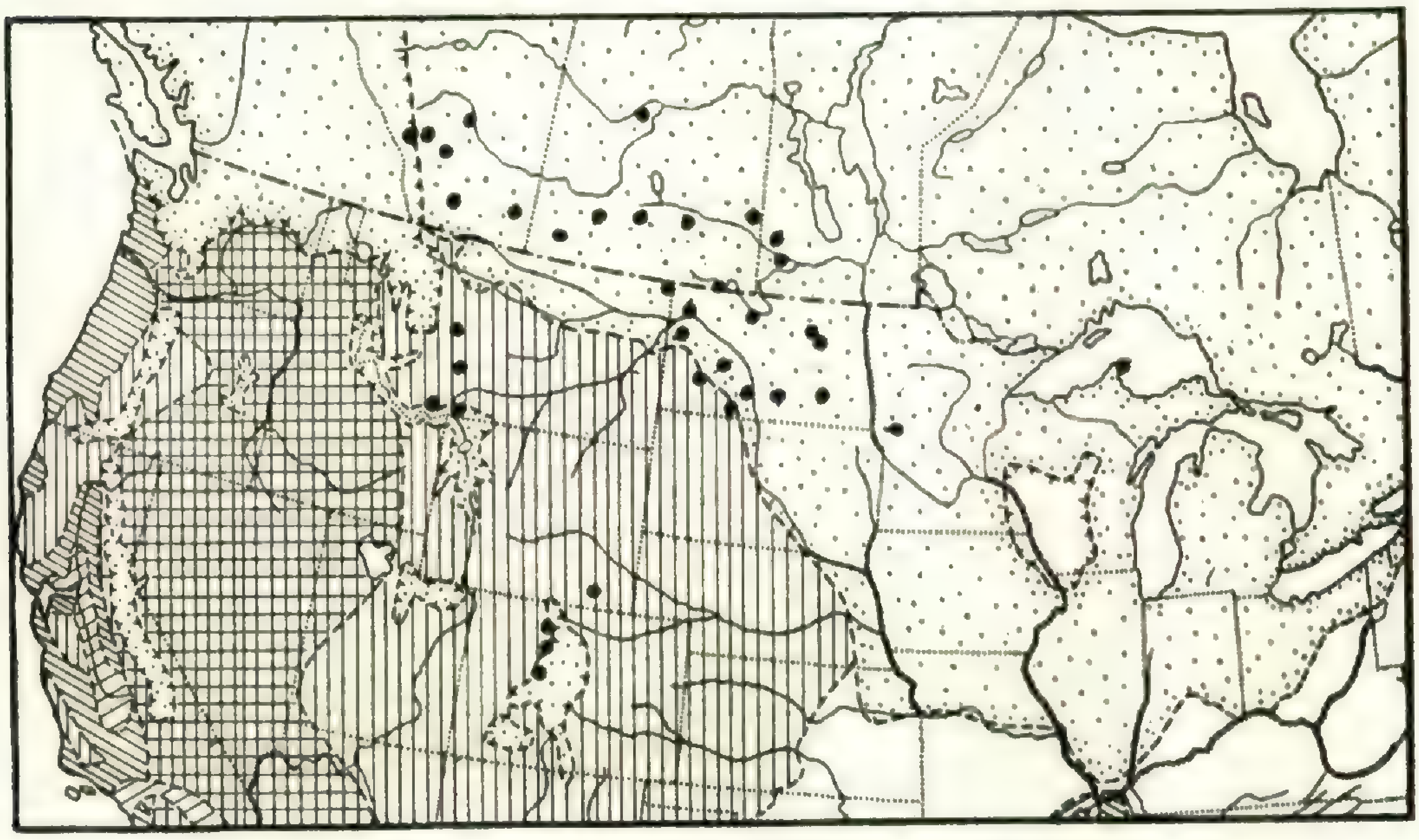


MAP 9. Range of ADENOCAULON BICOLOR.

Bluff, along with the cordilleran *Carex Rossii* Boott, *Woodsia oregana*, *Collinsia parviflora* and several other western types, is a xerophyte, and so is the misnamed *Potentilla pensylvanica* of the Cordillera and the Great Plains, growing with them. The type of *Chamaerhodos Nuttallii* came from "the highest gravelly hills" of the Mandan region; but the Keweenaw plant, also of "the highest gravelly hills," has been long enough isolated from the nearest area of the species (375 miles to the west, in western Minnesota) to have developed a marked varietal difference (PLATE 366).

The fixing of such a difference requires time, much more time than many modern laboratory experimenters imagine; and, certainly, the complete morphological segregation of a species from its geographically remote allies takes, except in the cases of hybrid-blends, a time

much longer than post-Wisconsin. In the ancient and long-weathered mantle shown in PLATE 354 we find *Ceanothus sanguineus, Collinsia parviflora* and several other isolated plants; but in the shaded gravel near-by the most interesting plant is an undescribed and very distinct



MAP 10. Range of CHAMAERHODOS NUTTALLII; var. KEWEENAWENSIS on Keweenaw Peninsula.

Arnica (PLATE 380), which is related only to a series of cordilleran species. Its nearest relative, *A. cordifolia* Hook., is unknown east of the Black Hills; the other members of the § *Cordifoliae*, as recognized by Rydberg (N. Am. Fl.) are restricted to the mountains from Alberta to Utah and westward.

One of the most elementary principles of the history of vegetation is that the species which make up the natural associations of plants successfully migrate together, not helter-skelter, into country favorable to them and, once occupying the territory, make "closed associations," *i. e.* they take such possession that later invaders have no entry, except as the natural and primitive habitat is disturbed (by clearing, plowing, land-slides, etc.). It will be noted from the maps that the western types which are isolated about the Upper Great Lakes are, in the Black Hills, in the Rocky Mountains or on the Pacific slope (south of north-central Washington, northern Idaho and northern Montana), in country which they undoubtedly occupied before Pleistocene time. They extend northward slightly into the region of the Cordilleran glaciation. The latter region, however, was un-

questionably quite as available to plant-occupation in the Pleistocene as are the ice-free forelands and cliffs of Greenland and Novaya Zemlya today. Here are the words of Chamberlain and Salisbury: "The whole Cordilleran ice-sheet was the product of a confluence of mountain glaciers deploying on the intervening plateau; but there appears to have been plateau glaciation not solely dependent on contributions of ice from the mountains. . . . The northern lobes descended the valleys tributary to the Yukon. . . . On the west, the plateau ice-cap seems to have sent tongues of ice through the gaps in the coast ranges at many points, and to have discharged thence into the Pacific. . . . Much the greater part of the 4,000,000 square miles of the ice-fields lay on the plains of Canada and in the upper Mississippi valley."[1] There is no more reason to suppose that the plants of the Pacific slope under discussion have invaded southern British Columbia since the waning of the Pleistocene valley- and plateau-glaciers than there would be to insist that Ellesmereland, Greenland, Spitzbergen, Novaya Zemlya, Switzerland, Glacier National Park, the Malaspina Glacier (covered with heavy forest) and the valleys of southern New Zealand are now destitute of vegetation. Everyone knows that they are not so.

Consequently, the occurrence of such plants on the Keweenaw Peninsula, in or adjacent to habitats where there are no obvious glacial drift or large transported boulders and where the long-continued subaerial weathering has produced a loose carpet or crust of angular gravel *in situ,* forces me to the conclusion that this region, like some others about the Upper Great Lakes, did not suffer a complete extermination of its flora in the Pleistocene, at least during the later glacial developments called the Wisconsin glaciation. In 1925, still retaining a naïve faith in what I had been taught but realizing that the considerable relic-flora about the Upper Great Lakes needed explanation, I wrote: "All geologists whom the author has consulted are in agreement, that the shores of the Great Lakes were all eroded or covered in the Wisconsin glaciation and even that some of the region (Isle Royale, for example) has been submerged beneath the surface of the lakes. It would, therefore, be hardly justifiable to account for these plants of the Pacific slope isolated on Isle Royale, Isle St. Ignace, Keweenaw Peninsula or Bruce Peninsula, as relics which there outlived the Wisconsin glaciation."[2] I then suggested

[1] Chamberlain & Salisbury, Earth Hist. iii. 330–333 (1906).

[2] Fernald, *Persistence of Plants in Unglaciated Areas of Boreal America*, Mem. Amer. Acad. xv. (Mem. Gray Herb. ii), 317 (1925).

that they might have survived in the Driftless Area to the southwest and thence later migrated to Lake Superior.

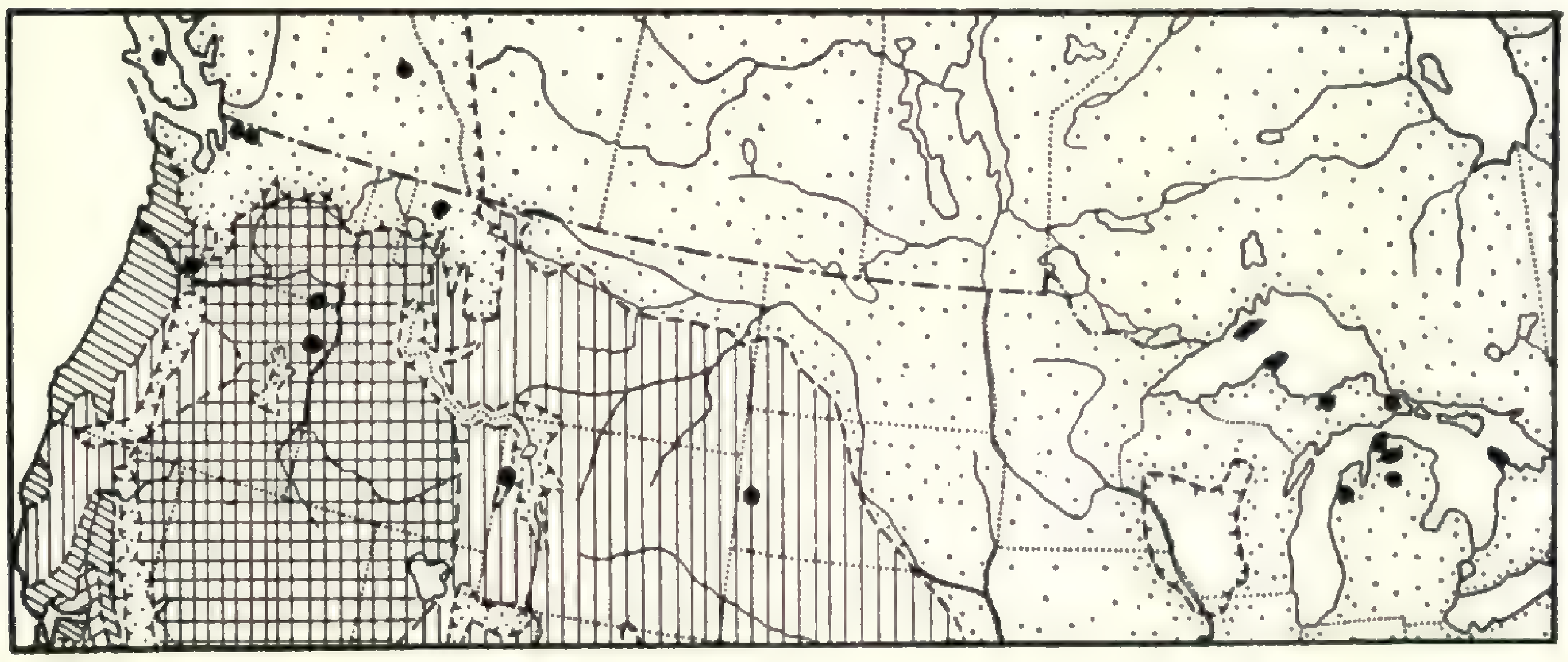
Fassett,[1] however, finds it difficult to conceive several of the isolated species of northern Michigan and northern Wisconsin (*Rubus parviflorus, Arenaria macrophylla, Goodyera decipiens, Osmorhiza divaricata*, etc.) as having been in The Driftless Area without leaving colonies in habitats there which would be favorable for them. Fassett continues: "The apparently preglacial flora of northern Wisconsin and neighboring territory has its affinities with the Rocky Mountains, with the Gaspé Peninsula, and with the Torngat Mountains. There is another relic flora in The Driftless Area . . . which has its affinities mostly with the region south of the area of Wisconsin glaciation. . . . This distinct relic flora, practically confined to The Driftless Area, with several endemics, having its affinities in unglaciated areas to the westward or to the southeastward, may be clearly interpreted on the basis of lack of glaciation in southwestern Wisconsin. But the occurrence in the Lake Superior region of plants of the Rocky Mountains and of the Gulf of St. Lawrence area is a problem that cannot at the present be solved with any degree of certainty."

Our experience in Keweenaw County leads us to the belief that Fassett's contention is well founded and that the isolation of plants in the Lake Superior region, some from the Rocky Mountains or the Black Hills (or from the Gaspé region), some from the arid high Plains, some from the Ozarkain and Appalachian plateaus (but none, I think, with distinctive Torngat relationship, except species of broad boreal dispersal), does not require the Pleistocene invasion by them of The Driftless Area. The Driftless Area (with emphasis on The) was not the only haven in the Great Lakes region during the Wisconsin glaciations. The high bluffs of Keweenaw evidently were not denuded by Wisconsin ice and, consequently, they served as centers on which many species survived (just as hundreds of species are living today on the available slopes and ice-free forelands of Greenland or of Novaya Zemlya), some later to spread slightly to lower levels and, in case of readily dispersed species, like *Rubus parviflorus* (maps 14–22), *Vaccinium ovalifolium* and *membranaceum* (map 7), *Osmorhiza divaricata, Goodyera decipiens, Melica Smithii* (map 11), *Festuca occidentalis* and *Adenocaulon bicolor* (map 9), to extend over much of the Upper Lakes region, while annuals, such as *Polygonum Douglasii, Epilobium paniculatum* and *Collinsia parviflora*, tend to become local weeds.

[1] Fassett, Rhodora, xxxiii. 226. 227 (1931).

Other species, such as *Asplenium montanum* (MAP 4) and *cryptolepis* (MAP 5), *Carex Rossii, Ceanothus sanguineus* (MAP 6), *Chamaerhodos Nuttallii* (MAP 10), *Potentilla Blaschkiana* and the endemic *Arnica*, have apparently not spread far or at all from their old havens.

These observations on the Keweenaw Peninsula inevitably suggest that similar conditions will be found in other sections of the Upper Great Lakes area, especially where elevated and vertical escarpments and sharp bluffs stand high above the general level.[1] So long as the botanist meekly accepts, without personally checking, the proposition that *all* the Upper Great Lakes region was completely under Wisconsin ice (and to a depth sometimes said to be 2,000 feet!) and then under the water of the Lakes he will fail to solve this striking



MAP 11. Range of MELICA SMITHII.

phytogeographic problem. If he will visit the high bluffs and escarpments and himself SEE the conditions, he is likely to find that the bluffs of Keweenaw are not alone in lacking the abundant transported drift with which orthodox geology has blanketed them. He is likely to find that their crests and slopes have, instead, a rotted and angular crust or deeply weathered mantle *in situ*. It will then be demonstrated that there were in the Upper Great Lakes region SEVERAL DRIFTLESS AREAS, limited in extent but sufficient to have maintained colonies of the formerly wide-spread and somewhat generalized Tertiary flora, species which, in areas of active Wisconsin glaciation, were eliminated in favor of a younger and more aggressive series of plants.

I realize that the current interpretation of many ecologists favors

[1] One such area has been reported to me. It is hoped that its discoverers and explorers will soon give an account of it. Two others, where Wisconsin activity seems to have been slight, are awaiting examination.

an arid ("xerothermic") climate following the Wisconsin glaciation and a migration then into the areas which had been covered by Wisconsin ice of a flora which has subsequently become segregated or disrupted by a post-Wisconsin climatic change. Personally "I am from Missouri" regarding this proposition. If *Ceanothus sanguineus* (MAP 6), *Woodsia oregana, Carex Rossii* and other western xerophytes are interpreted as relics of colonies which extended across the Great Plains to Keweenaw in the reputed early arid spell, why have they so completely disappeared from the great arid stretch of Plains, with their bluffs and crests, which should now suit them? They are accompanied in Keweenaw by western mesophytes, such as *Melica Smithii* (MAP 11), *Corallorrhiza striata, Vaccinium membranaceum* (MAP 7), *Rubus parviflorus* (MAPS 14–22), *Adenocaulon bicolor* (MAP 9) and others. Would those who believe in the "xerothermic" post-Wisconsin climate maintain that these mesophytes also crossed the Plains and reached Keweenaw during their "xerothermic" stage? I cannot believe it.

Altogether these recent short excursions of New Englanders about the Upper Great Lakes have yielded many species apparently little known or hitherto unreported in the region. In so far as they are yet worked out they are here reported; and in a few instances noteworthy species, although not collected by us, are specially discussed. The photographs of the terrain and of growing *Rubus parviflorus* here reproduced were taken by Henry G. Fernald. The maps of ranges have been prepared by my daughter, Miss Katharine Fernald, with a contribution of data from the Ozark Plateau from Julian A. Steyermark. The smaller-scale base-map used for several species was prepared for me by the geologist, Alfred W. Lott. It is presented in full as MAP 1, which gives the necessary explanations. The other base-map of eastern North America carries its own explanation. The world-projection used is Goode's no. 201 Pc, copyrighted by the University of Chicago. The photographs of herbarium specimens and their details have been prepared by my student and special assistant, E. C. Ogden. The expense involved in the preparation and reproduction of the plates and maps has been met in part from the Wyeth Fund of the Division of Biology, in part through a grant from the Milton Fund for Research, both of Harvard University.

Part II. Taxonomic and Floristic Notes

In the succeeding pages all our records are entered which might prove useful to students of the local flora. Unless otherwise noted the collectors are *Fernald & Pease.*

Woodsia alpina (Bolton) S. F. Gray. Michigan: crevices and talus of greenstone and calcareous conglomerate bluffs in woods, east of Eagle Harbor, Keweenaw Co., no. 3051.

Whether this is a different station from that of Farwell I do not know.

W. oregana D. C. Eaton. Michigan: partly shaded crevices and talus of sandstone-conglomerate, West Bluff, Keweenaw Co., no. 3052. See p. 213.

C. K. Dodge, in his *Fern Flora of Michigan,* Fern. Bull. xx. 13 (1912), cited "South shore of Lake Superior," which was derived from the old collection of Robbins. This record, which was started in this form by D. C. Eaton in Gray, Man. ed. 5: 669 (1867), appeared as "the Keweenaw Peninsula" in Eaton, Ferns N. Am. ii. 185 (1880). The late C. F. Wheeler got it on the Menominee River (McAtee, Pap. Mich. Acad. i. 160).

Pteretis nodulosa (Michx.) Nieuwl., f. **pubescens** (Terry), comb. nov. *Struthiopteris germanica,* f. *pubescens* Terry, Fern. Bull. xvi. 5 (1908) inadvertently misnamed but corrected on p. 49 (1908). *S. germanica,* var. *pubescens* (Terry) A. A. Eaton, Fern. Bull. xvi. 47 (1908). *S. pubescens* (Terry) Clute, Fern. Bull. xvi. 48 (1908). *S. pennsylvanica,* f. *pubescens* (Terry) Clute, l. c. (1908). *Matteuccia pubescens* (Terry) Clute, l. c. (1908). *M. Struthiopteris,* f. *pubescens* (Terry) Clute, l. c. (1908). *M. Struthiopteris,* var. *pubescens* (Terry) Clute, l. c. (1908).

This very striking form, with canescent-tomentulose, instead of glabrous and lustrous rachis, abounds in rich deciduous woods near Mohawk, Keweenaw Co., Michigan, no. 3053.

The form of the ordinary Ostrich Fern with fertile fronds approaching the sterile in form is

P. nodulosa, f. **obtusilobata** (Clute), comb. nov. *Onoclea Struthiopteris,* f. *obtusilobata* Clute, Fern. Bull. xviii. 111 (1910). *Struthiopteris germanica,* f. *obtusilobata* Clute, l. c. (1910).

Thelypteris Robertiana (Hoffm.) Slosson. *Phegopteris Robertiana* (Hoffm.) A. Br. Michigan: wooded slope, talus of limestone cliff, Burnt Bluff, Delta Co., no. 3044.

Recorded by Gates & Ehlers from Cheboygan Co. (Pap. Mich. Acad. xiii. 68).

T. fragrans (L.) Nieuwl., var. Hookeriana Fern. To the Ontario

and Michigan stations recorded by me in Rhodora, xxv. 4 (1923) the following, represented in the Gray Herbarium, may be added. Ontario: cliff slide, Devil's Mt., Timagami Region, *E. & D. M. Anderson*, no. 26,009B; cliffs, South Slate Island, Thunder Bay District, *Pease & Bean*, no. 23,447. Michigan: crevices and talus of greenstone bluffs in dry woods near Cliff, Keweenaw Co., no. 3045; crevices and talus of greenstone and calcareous conglomerate bluffs in woods, east of Eagle Harbor, Keweenaw Co., no. 3046; seen on several other cliffs in Keweenaw Co.

Polystichum Lonchitis (L.) Roth. Dodge merely repeats the statement from Beal's Michigan Flora (1904): "Woods south shore of Lake Superior, Prof. Whitney; Keweenaw Co., O. A. Farwell." The following Michigan specimens are in the Gray Herbarium: Lake Superior, Upper Michigan, *State Collection;* south shore of Lake Superior, *C. T. Jackson;* rocky woods, southern shore of Lake Superior, 1863, *Robbins;* Clifton, Keweenaw Co., August, 1885, *T. E. Boyce;* rich, deciduous woods, Delaware, Keweenaw Co., no. 3041; Houghton, *Pammel & Fisk,* no. 457; rocks near Chatham, Alger Co., August 29, 1900, *C. F. Wheeler.* See p. 207 and map 3.

P. Braunii (Spenner) Fée, var. Purshii Fern. The westernmost stations represented in the Gray Herbarium are the following. Ontario: rich wooded bank near Agawa River, Agawa Bay, Algoma District, *Pease,* no. 17,964. Michigan: south shore of Lake Superior, 1849, *Whitney;* woods, Keweenaw Peninsula, 1863, *Robbins,* 1888, *Farwell,* no. 617; rich, deciduous woods near Mohawk, Keweenaw Co., no. 3043; rich deciduous woods above Miner's Falls, near Munising, Alger Co., no. 3042.

Phyllitis Scolopendrium (L.) Newm., var. **americana,** var. nov. (tab. 355, figs. 2, 4, et 6), squamis stipitis tenuissimis longe caudatis flexuosis; frondibus plerumque supra medium fructiferis; indusiis lineari-oblongis longioribus 0.3–2.2 (av. 1.25) cm. longis; costis plerumque glabratis; foveolis lineari-oblanceolatis vix marginalibus.—Highly localized in New Brunswick, New York, Ontario and Tennessee. Type: abundant in horizontal seams of dolomite in deciduous woods, Ingalls Falls, Grey Co., Ontario, June 19, 1934, *M. L. Fernald* with R. B. Thomson and J. G. Wright), no. 3040 (in Gray Herb.). See p. 201 and map 2.

The Hart's Tongue of eastern North America is famous and much discussed on account of its extreme localization: St. John Valley, near Woodstock, New Brunswick (station perhaps destroyed); local stations in Madison County and larger ones (one of them destroyed) in Onondaga County, New York; frequent stations on the dolomite of Grey, Durham and Bruce Counties, Ontario; and a limestone sinkhole in Marion County, Tennessee. The nearly 40 collections of it in the Gray Herbarium show it to average a much smaller plant than the European, with less numerous and shorter indusia, with the deli-

cate curling scales of the stipe all long-caudate and linear-filiform, without the broader and flatter lance- or linear-attenuate scales which occur in the European; the midrib more promptly glabrate; the fronds usually fruiting only in the upper half instead of nearly or quite their full length; the indusia averaging much shorter and the foveolae (enlarged tips of veinlets) more elongate and farther from the margin than in the European. The specifications follow:

67 fronds of the European plant give a range in length of 0.9–6 (AVERAGE 3) DM.; 67 fronds of the North American a range in length of 1.1–3.4 (AVERAGE 2.3) DM. 57 fertile fronds of the European plants show the indusia to occupy 33–100 (AVERAGE 73) PERCENT of the total length of the frond; 65 fertile fronds of the American plant giving an AVERAGE OF 54 PERCENT. Expressed in another way, the length of the fruiting portion in the European gives an AVERAGE OF 2.1 DM.; in the American OF 1.3 DM. The indusia are variable in length on the same frond, sometimes tolerably uniform, sometimes with short ones of various lengths alternating with the longer. Measuring the longest on each frond we get the longest indusia in the European series 0.7–3.3 (AVERAGE 1.7) CM. LONG; in the American 0.3–2.2 (AVERAGE 1.2) CM. LONG. The foveolae (enlarged tips of the veinlets), seen by transmitted light, in the European plant are elliptic and nearly marginal in the frond; in the American plant they are more slender and end a little farther from the margin. These points are well displayed in PLATE 355, showing a small frond of European *Phyllitis Scolopendrium* on the left (FIG. 1), of var. *americana* on the right (FIG. 2), with enlargements, × 10, of the stipes (to show the chaff) and of the foveolae added as inserts (FIGS. 3 and 5 from European specimens; FIGS. 4 and 6 from American).

The only other variation of *Phyllitis Scolopendrium* in North America is the plant of Chiapas in southern Mexico. This has the chaff *very* slender and sublanate and extending nearly the length of the midrib beneath; and the foveolae are elliptic and marginal. Although it is sometimes maintained as a species, I agree with Christ, Christensen, D. C. Eaton, Hemsley, Hooker & Baker and Milde in leaving it in *P. Scolopendrium* as a geographically isolated variety.

Var. **Lindeni** (Hook.), comb. nov. *Scolopendrium Lindeni* Hook. Ic. Pl. t. 488 (1842). *P. Lindeni* (Hook.) Maxon, Fernw. Papers, 42 (1900).

For discussion and map of the inclusive *Phyllitis Scolopendrium* see p. 201 and MAP 2.

Pellaea atropurpurea (L.) Link. Michigan: wind-swept crests, crevices and talus of sandstone-conglomerate, West Bluff, Keweenaw County, no. 3035.

It is not possible, without seeing the material, to be certain whether the only record for Michigan (Norway, Dickinson Co.) given by Dodge belongs to this or the next.

P. glabella Mett. Michigan: crevices and talus of limestone cliff, Burnt Bluff, Delta Co., no. 3034.

Cryptogramma Stelleri (Gmel.) Prantl. Probably more frequent on the Upper Peninsula of Michigan than indicated by the one indefinite and the one definite locality cited by Dodge. We twice collected it in Michigan: cliffs about Miner's Falls, near Munising, Alger Co., no. 3036; limestone escarpment in woods south of Garden, Delta Co., no. 3037.

(*To be continued*)

THE NOMENCLATURE OF SOME SPECIES OF CORNUS

Carl A. Buhl

Rickett did an admirable piece of research in logically identifying *C. amomum* Miller with the reddish-pubescent silky cornel rather than with *C. stolonifera* Michaux to which it was transferred by Farwell (Rhodora **33**, 71. 1931). There can be no doubt that the current usage should prevail. However, I cannot agree with Rickett that *C. obliqua* Rafinesque is a *nomen dubium* since the bluish fruit, lanceolate leaves yellowish-glaucous beneath, reddish-brown branches slightly pubescent in the upper parts, and the type locality clearly indicate that Rafinesque described the interior relative of *C. amomum* Miller. Although this shrub usually has leaves whitish-pubescent beneath, plants can easily be found with lanceolate leaves practically glabrous at maturity. This shrub is certainly as clearly marked as is *C. baileyi* Coulter & Evans, a usually[1] recognised species, although the primary stone character separating the latter from *C. stolonifera* Michaux has been disproved by Deam (Shrubs of Indiana 2nd ed. pp. 258–260. 1932). And if, at some future date, this shrub is reduced to varietal status, it would be best to adopt the varietal name *albescens* (Farwell) rather than Meyer's dubious name *Schuetzeana* doubtfully proposed from specimens supposedly collected near Wash-

[1] *C. Baileyi* was formally reduced to varietal rank, as *C. stolonifera*, var. *Baileyi* (Coult. & Evans) Drescher, Trans. Wisc. Acad. Sci. Arts & Lett. xxviii. 190 (1933).—Eds.

ington, a place where this form, if it occurs at all, is very scarce. The revised synonymy is as follows:

C. obliqua Rafinesque, West. Rev. **1**, 229 (1819).
?*C. sericea* γ? *schuetzeana* Meyer, Mem. Acad. Imp. Sci. St-Peterb. (6 ser.) **7**, pt. 2, 219 (1849).
C. purpusi Koehne, Gartenflora **48**, 338 (1899).
C. cyanocarpus var. *albescens* Farwell, Rhodora **33**, 70 (1931).
C. amomum var. *schuetzeana* Rickett, Rhodora **36**, 274 (1934).

In addition, Rickett certainly did not demonstrate that *C. candidissima* Miller should supersede *C. stricta* Lamarck. Suppositions of correct citations made at a time of much poorer taxonomic knowledge and imperfect specimens cast grave doubt on the supposed identity of *C. candidissima* Miller. It is to be regretted that the color of the pith of the Clayton specimen mentioned by Rickett (loc. cit. p. 273) was not recorded, as that could have furnished the best proof of the identity of the specimen and it would have lent considerable weight to Rickett's hypothesis. The Plukenet reference (*Cornus foemina, candidissimis foliis, americana* (Almag.: 120, 1696)) is far too meagre a link in Rickett's chain of reasoning. The phrase *umbellis involucro minoribus* cited is easiest explained as contrasting with the *umbellis involucro maximo* of the description of *C. florida* rather than derived from the Clayton specimen cited by Gronovius (Fl. Virg. 17 1739). Miller must have considered *C. candidissima* and *C. foemina* as distinct entities but there are no distinguishable differences either in the descriptions or discussion. Both must remain *nomina dubia*, a procedure entailing no difficulties since the species to which these names have been variously applied all possess definite names in current use.

Chicago Academy of Sciences,

Note on the Periodic Fruiting of Coprinus micaceus—During the summer of 1933 the writer passed daily a decorticated stump of an Elm tree on the top and sides of which he frequently noticed fruiting profusely quantities of *Coprinus micaceus* Fr. The stump projects about nine inches above the ground and is located about 1000 feet from the Biological Laboratories in a spot which is completely shaded from exposure to direct sunlight. At first no particular attention was given to this fungus, yet presently it became apparent that the periodic appearance was very uniform, so much so that it was possible to determine nearly four weeks in advance when material

would be available for class use. However, no data were kept on the occurrence during this year.

When, however, the same fungus fruit bodies began to appear on the stump in the following spring, the writer was curious enough to note, at first casually, then with increasing interest, the dates on which fruiting occurred, beginning the last of May, after three fruitings had passed. From the first appearance of the small buttons until the final deliquescence of the mature bodies about 36 hours elapsed. Exact observations were impossible on this point, since fruiting usually began during the night, and final disintegration was only a matter of estimate. While recording included complete duration so far as possible, the following figures are based on the middle time of fruiting, that is, a point arbitrarily chosen half way between the estimated beginning and end of fruiting.

Fruitings were observed to occur on:

Date	*Interval elapsed from previous fruiting*	*Date*	*Interval elapsed from previous fruiting*
1. May 25		8. August 1	9.5 days
2. June 5	11 days	9. August 9–10	8.5 days
(3. June 16	11 days)[1]	10. August 19–20	9.5 days
4. June 26–27	10.5 days	11. August 30–31	11 days
5. July 6	9.5 days	12. September 10	10.5 days
6. July 14–15	8.5 days	13. September 20	10 days
7. July 22–23	8 days	14. September 30	10 days

While observations were continued during two additional months, no further fruiting of *Coprinus* occurred; instead the massed fruits of *Collybia velutipes* Fr. developed in great profusion over a period of three weeks from October 15.

This regular recurrence of fruiting would seem to indicate that external factors could not be the cause of the regularity observed. However, to make sure of this possibility, the writer examined at the Geographic Institute of Harvard University the charts showing hourly variations in temperature and humidity and the precipitation records to discover whether any correlations occurred. Absolutely none could be found, which would seem to show that the only factor concerned is the time necessary for the storing up of the needed food reserves, after which fruiting will occur regardless of external conditions.—R. M. Whelden, Biological Laboratories, Harvard University.

[1] The writer returned from a short vacation to discover the fungi in the state of disintegration characteristic of the end of a fruiting period.

A NEW ARENARIA FROM ALASKA

W. B. Drew

Among the interesting plants brought to the Gray Herbarium by Robert H. Bates of the Bradford Washburn Mt. Crillon Expedition (Alaska) was an *Arenaria* which apparently has not been heretofore recorded. This new species of *Arenaria* was collected by Bates at an elevation of 5800 ft., on Mt. Crillon, an altitude above which no vascular plants were observed.

A study of the material from Mt. Crillon indicates that the Alaskan plant is more closely related to *Arenaria sajanensis* Willd. than to any other of the North American species of the section *Alsine* to which our plant belongs. In the size of floral parts and the relative length of the mature fruiting capsule to the calyx, the Alaskan plant agrees with *A. sajanensis*. My plant differs from the latter, however, in having seeds which bear scale-like or short, flat cilia, since in *A. sajanensis* the seeds are naked and unappendaged. Moreover, the leaves, and often the sepals as well, of the Alaskan *Arenaria* are spiny-ciliate whereas in *A. sajanensis* these stiff cilia are lacking. In this character of spiny-ciliate leaves and sepals, my plant is closely related to the European *A. imbricata* Marsch. Bieb. This European plant differs from mine, however, in the following respects: leaves longer, much narrower, linear to lance-ovate, subacute to acuminate, usually tipped with a spine and not as prominently trinervate; cilia of the leaves finer, usually short and inconspicuous; sepals not usually prominently trinervate, and lacking the coarse cilia of the Alaskan plant; peduncles longer and more glandular-hispid. In the size of flowers, the length of fruiting capsule and the characters of the seeds, the two plants appear very nearly similar. In habit, the Alaskan plant closely simulates the European *A. Cherleria* (Peterm.) Ard.; but, in the absence of the long foliar cilia, the glabrous pedicels and calyces, the smaller flowers (2.5–3 mm. as against 6 mm. of the Alaskan plant), and the very small eciliate seeds, the Old World plant is distinctly separated.

Accordingly, the Mt. Crillon plant may be diagnosed as follows:

Arenaria **crilloniana**, sp. nov. Planta acaulescens vel sub-acaulescens, dense cespitosa; foliis plus minusve imbricatis, brevibus, 1–5 mm. longis, coriaceis, plerumque manifeste trinervatis, anguste lanceolato-ovatis, obtusis vel subacutis, marginibus longe ciliatis: ciliis 1–5 cellulatis plerumque 0.5–1.5 mm. longis; floribus circa 6 mm. longis; pedicellis brevissimis, glanduloso-pubescentibus (2–5 mm.

longis); petalis albis vel purpurantibus, leviter emarginatis, 5–5.5 mm. longis, obovato-spathulatis, sepala aequantibus vel superantibus; sepalis 5, manifeste trinervatis, exigue glanduloso-pubescentibus, lanceolato-ovatis, marginibus plus minusve ciliatis, apice obtusis vel rotundatis; staminibus 10; stylis 3, brevibus separatis; capsula sepala paullo superanti, maturitate tripartita; seminibus reniformi-orbiculatis 0.5–0.75 mm. latis, marginibus breviter ciliolatis.

Plants acaulescent to subacaulescent, densely cespitose, with more or less imbricated leaves: leaves short, (1–5 mm. long), thick, more or less coriaceus, usually prominently trinervate, narrowly lance-ovate, obtuse to subacute, with long-ciliate, serrulate margins: cilia 1–5 celled, mostly 0.5–1.5 mm. long; flowers approximately 6 mm. long, on very short glandular-pubescent pedicels (2–5 mm. long): petals white to purplish, slightly if at all notched, 5–5.5 mm. long, obovate-spatulate, equalling or sometimes slightly exceeding the sepals: sepals 5, green, prominently trinervate, very sparsely glandular-pubescent, lance-ovate, more or less ciliate on the margins, obtuse to rounded at the apices; stamens 10, included; styles 3, short, separate; capsules slightly exceeding the sepals, splitting into 3 segments at maturity, each valve barely notched at the apex; seeds reniform-orbicular, 0.5–0.75 mm. in diameter, with short-ciliate margins.—Known only from the type station on Mt. Crillon. Alaska: along sides of ridge, 5800 ft., Mt. Crillon, July 14–16, 1933, *Robert H. Bates* (type in the Gray Herbarium).

Gray Herbarium.

Notes on Rocky Mountain Plants.—Artemisia Pattersoni Gray, var. **glabrior**, var. nov., bracteis foliisque subglabris.—Colorado: Mt. Evans, alt. 12–13,000 ft., August 23, 1934. *L. and E. H. Kelso* 105 (type, in my collection). New Mexico: Baldy Peak, Colfax County, above timberline, alt. about 3,600 meters, September 4, 1916, *Standley* 14,360; Baldy, August 14, 1910, *Wooton.*

Bracts and leaves glabrate.

Typical *A. Pattersoni* from Gray's Peak, Colorado, is smaller, and with bracts and leaves densely tomentose. *A. Pattersoni* has not been previously recorded from New Mexico. Wooton and Standley in their Flora of New Mexico combined it with *A. scopulorum*. *A. Pattersoni* is distinct in always having the corollas glabrous.

Artemisia scopulorum Gray, var. **aggregata**, var. nov., capitulis dense aggregatis.—Colorado: Mt. Evans, alt. 13,000 ft., August 23, 1934. *L. and E. H. Kelso* 104 (type, in my collection).

Heads aggregated in a subcapitate cluster at the top of the stem.

In typical *A. scopulorum* the heads are racemosely or spicately disposed along the stem no matter how dwarfed the plant may be.

CASTILLEJA PULCHELLA Rydb., var. **acutina**, var. nov., lobis mediis bracteorum superiorum anguste lanceolatis acutis.—MONTANA: Yellowstone National Park, Electric Peak, alt. 10,000 ft., July 27, 1931, *L. Kelso* 3506 (TYPE, in my collection).

Similar to *C. pulchella* but middle lobes of the upper bracts narlowly lanceolate and acute instead of rounded or truncate.

CASTILLEJA BRACHYANTHA Rydb., var. **subinflata**, var. nov., calyce in latere superiore vix vel non inciso; port anthesin magis inflato.—COLORADO: Echo Lake, alt. 10,000 ft., August 5, 1932. *L. Kelso* 3387 (TYPE, in my collection).

Calyx scarcely or not at all cleft on upper side, more inflated in fruit; otherwise similar to the species.

This form was also collected above timberline at Cassell's, Colorado, on Mt. Blaine; and at altitude of 13,000 ft. on Mt. Evans. In these localities it appears in this form only.

LATHYRUS INCANUS Rydb., f. **albidus**, f. nov., corollis albis.—COLORADO: Aurora, June 4, 1929. *L. Kelso* 3381 (TYPE, in my collection).

Similar to *Lathyrus incanus* but corolla white instead of purple.

ESTELLE HENDERSON KELSO, Washington, D. C.

MOSS FLORA OF NORTH AMERICA.—Something over six years ago[1] Dr. Grout announced the forthcoming publication of a Moss Flora of North America, designed to include adequate scientific descriptions of all species known to occur in North America north of Mexico, together with illustrations of practically all species not already illustrated in the author's well-known "Mosses with hand-lens and microscope." Part 1 of volume 3 appeared shortly thereafter and was reviewed by Prof. J. F. Collins in this journal.[2] Volume 3 has now been completed; as also part 1 of volume 2.[3]

Like the earlier work referred to above, the present one is printed on large octavo paper, but in much smaller type, more closely spaced, so that a page of text in the new volume is equivalent to nearly a page and a half in the old. The plates in part are original; in part they are reproduced from standard authorities, both old and modern. In the arrangement of material the present volume, as compared with the earlier one, is much better organized; in its treatment of material it is more concise, more complete and more scientifically exact. For the various individual species, in addition to adequate descriptions, ample synonomy-citations are given,

[1] Bryologist **31**, p. 47. 1928.

[2] RHODORA **31**: 38, 39. 1929.

[3] Moss flora of North America, north of Mexico, by A. J. Grout, Ph.D. Vol. 3, part 1, pp. 1–62, pls. 1–14, September, 1928. Vol. 3, part 2, pp. 63–114, pls. 15–29, June, 1931. Vol. 3, part 3. pp. 115–178, pls. 30–44, November, 1932. Vol. 2, part 1, pp. 1–65, pls. 1–25, November, 1933. Vol. 3, part 4, pp. 179–277, pls. 45–80, August, 1934. Published by the author, 1 Vine St., New Brighton, Staten Island. Price $2.50 per part.

together with carefully systematized statements regarding type locality, geographical distribution, habitat, illustrations in other works, and representation in exsiccati. Brief supplementary remarks direct attention to salient characteristics which are of service in distinguishing particular species from other closely related forms—a most useful feature. The keys to genera and species, for the most part, are admirably constructed.

Last in the final order of sequence but first to be completed, volume 3 deals with what are commonly referred to as the pleurocarpous mosses and, even if the project should be carried no further, a very useful end would have been achieved in this one volume. Nearly two-thirds of the text here is devoted to the *Hypnaceae*, under which family Dr. Grout includes as subfamilies nine groups which by many authors are treated as distinct families, namely the *Climacieae*, *Porotricheae*, *Brachythecieae*, *Amblystegieae*, *Hylocomieae*, *Hypneae*, *Stereophylleae*, *Plagiothecieae*, and *Entodonteae*. The remaining one-third takes up the *Leskeaceae* (subfamilies *Thuidieae*, *Leskeae*, *Thelieae*, and *Anomodonteae*), *Hookeriaceae*, *Neckeraceae*, *Meteoriaceae*, *Pterobryaceae*, *Leucodontaceae*, *Cryphaeaceae*, *Fabroniaceae*, and *Fontinalaceae*, the text for the last-named family being contributed by Dr. Winona H. Welch. Part 1 of volume 2, by Mr. G. N. Jones, separately indexed and a unit in itself, covers the *Grimmiaceae*.[1]

The value of a work such as this to American moss students can scarcely be overestimated. Much more in the bryophytes than in the higher plants, various species are transcontinental in range or else occur in widely separated localities, both east and west. And yet fifty years have elapsed since the publication of the Lesquereux & James "Manual of the Mosses of North America" (1884), the last book to appear which even pretends to give a descriptive account of the mosses of this country, taken as a whole.[2] During the time which has elapsed since then, great progress has been made in the study of mosses in this country. For the species listed in the Manual, the exploration of new country and the more intensive examination of old have greatly increased our knowledge of geographical distribution, Various European species not then recognized as occurring in this country have been discovered, while others have been found to be different which at that time were referred to well-known European forms. Almost countless new species and varieties have been described, in widely scattered publications, while critical studies have completely changed our views regarding many of the then-recognized species and groups of species. In brief, Dr. Grout's latest book represents a very timely and much needed contribution to American bryological literature.—G. E. NICHOLS.

[1] See review by Prof. Collins in RHODORA **36**, p. 60. 1934.

[2] This, of course, was the aim of "North American Flora," published by the New York Botanical Garden; but thus far only two parts (166 pp.) of the volumes dealing with the mosses have been issued, and these more than twenty years ago.

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A NEW SPECIES OF ANTENNARIA FROM THE APPALACHIAN REGION

G. Ledyard Stebbins, Jr.

In 1931, while studying the cytology of Antennaria, I noticed some specimens from Virginia identified as *A. neodioica* which looked smaller than the usual forms, and which appeared to be blooming earlier than typical *A. neodioica* in the same region. Some of these, moreover, had abundant staminate plants, which are notably rare, though occasionally found, in *A. neodioica.* Through the kindness of Mr. F. W. Hunnewell, one of whose collections was of this small form, I had an opportunity of examining the specimens in his personal collection, and found several sheets of it, some of which contained only staminate plants. One collection, from a large shale slope on Three Top Mt., Strasburg, Va., was very characteristic, and Mr. Hunnewell told me of its great abundance in that locality. Accordingly, I visited the spot in the spring of 1932, and although I was too early to obtain mature plants, I could recognize from the young buds that the staminate plants were as abundant as the pistillate, if not more so. I gathered enough young plants so that I could bring them to flower in pots, and found that they corresponded exactly with Mr. Hunnewell's specimens. The same spring I examined specimens in the herbarium of Dr. S. F. Blake, collected by Dr. H. A. Allard on a different part of the same hill. These were all staminate, and of the same size as the Hunnewell specimens, but differed considerably in the shape of the basal leaves and of the involucral bracts.

In the following year, 1933, Dr. Earl L. Core, of the University of West Virginia, very kindly met me at Hanging Rock, W. Va., and

took me to the farm of Wilbert M. Frye, about two and a half miles north of U. S. Highway no. 50, and lying in a narrow valley underlain by shale of Devonian age. We spent the day walking over the farm with Mr. Frye, and in the soft shaly soil, both along the roadside and in the open woods, the small *Antennaria* was very abundant, with the staminate plants again more common than the pistillate. Although the date was only April thirteenth, the plants were almost in bloom in sunny spots, and as far advanced as those of *A. plantaginifolia*. The few plants of *A. neglecta* seen had only tight buds among the basal leaves, while in typical *A. neodioica*, which was common, and easily distinguished by its larger, longer-petioled leaves, the plants were not far beyond their winter condition, and buds were not yet in evidence. In many places, the small plants were very conspicuous from the rosy pink bracts of the staminate involucres.

On my return from Hanging Rock, I found the same form at two places along route 50 in Virginia; west of Gore and east of Hayfield, although at the former locality it was too young to collect.

Later in the season, Mr. Frye very generously made a large collection for me of all the forms of Antennaria occurring around Hanging Rock, on the basis of which the differences between the small species and *A. neodioica* were quite apparent, and two different varieties of the former could be recognized. In their extreme forms they looked quite distinct, but they apparently intergrade so freely that they had best be described as well marked varieties of the same species.

More recently, I have re-examined specimens from the Gray Herbarium (cited as G.,) through the kindness of Mr. Weatherby, and Mr. Hunnewell's collection, (cited as F. W. H.) and have examined others from the United States National Herbarium (U. S.), the herbaria of the Carnegie Museum at Pittsburgh (Pitt.) and of the Academy of Natural Sciences at Philadelphia (Phila.,); from the personal collection of Dr. S. F. Blake (S. F. B.,) and of my own collection, (G. L. S.) which includes specimens sent me by Miss Lena Artz, of Woodstock, Va. To all those whose kind generosity has made these specimens available I wish to express my thanks and appreciation.

Antennaria virginica, sp. nov., stolonibus foliosis 0.6–2.5 cm. longis; foliis basilaribus cuneato-oblanceolatis, acutis, mucronatis, petiolatis, cum petiolo 10–25 mm. longis, 3–7 mm. latis, tomentosis; caule florifero plantae masculae 3–12 cm. alto; foliis caulinis 4–7, tomentosis, linearibus, mediis 10–14 mm. longis, 0.5–1.8 mm. latis, superioribus 5–10 mm. longis apice scarioso lanceolato 0.5–2 mm. longo munitis; capitulis masculis 1–5, dense corymbosis, pedunculis 0.5–4 mm.

longis; involucro masculo 3.8–5 mm. alto, bracteis biseriatis, anguste oblongis, obtusis vel acutis, margine erosis, lacteis vel stramineis; corolla 2.5–3.5 mm. longo; capillis pappi dilatatis, profunde dentatis vel acute lobatis; caule florifero plantae femineae 6–20 cm. alto; foliis caulinis 5–7, apice attenuatis, scariosis vel herbaceis; capitulis femineis 1–6, dense corymbosis; pedunculis 1–10(–25) mm. longis; involucro femineo 4.5–6.5 mm. alto, bracteis 3–4-seriatis, oblongis vel lanceolatis, exterioribus obtusis vel acutis, 0.8–0.9 mm. latis, interioribus acuminatis, 0.5–0.6 mm. latis, margine erosis, lacteis vel stramineis; corolla 3.2–4.2, cum stylo 3.8–5 mm. longo, stylo exserto bifido, achaeniis sparse pubescentibus, 1.1–1.3 mm. longis.—Very locally in Vermont and central New York (?), and from southern Pennsylvania through the Appalachian mountain region to Virginia and West Virginia. The following specimens have been examined. VERMONT: Middlebury, *E. Brainerd*, May 14 and 30, pist., in part (as *A. neodioica*, U. S.). PENNSYLVANIA: roadside bank, in dry shaly soil along Sherman's Creek, west of Dromgold, Perry County, *G. L. Stebbins Jr.*, no. 1050, stam. (G. L. S.). VIRGINIA: steep railroad embankment, in red, shaly soil, foot of Signal Knob, near Strasburg, Shenandoah County, *H. A. Allard*, May 16, 1931, stam., as *A. neodioica* (S. F. B.); same locality, *S. F. Blake*, no. 11735 stam. (S. F. B.); shale slopes, Woodstock, *Lena Artz*, April 30, 1933, in part, pist. (G. L. S.); low ground under pines, East Furnace, Shenandoah County, *Artz*, April 29, 1933; dry woods, Covington, Alleghany County, *F. W. Hunnewell*, no. 4096 stam. as *A. neodioica* (F. W. H.); dry woods, Hot Springs, Bath County, *F. W. Hunnewell*, no. 4097 in part, as *A. neodioica* stam. (in F. W. H.), pist. (in G.); Bedford County, *A. H. Curtiss*, 1871 stam. as *A. neodioica* (G., U. S.). WEST VIRGINIA: dry, open woods and roadsides, in shaly soil, Hanging Rock, Hampshire County, *Earl Core*, *W. M. Frye* and *G. L. Stebbins, Jr.*, no. 1031 stam. (G. L. S.); *W. M. Frye*, nos. 3 (TYPE, in Gray Herbarium, stam. and pist.), 4, 5, 6, 7, 11, stam. and pist. (G. L. S., G., U. S., S. F. B.); dry, open woods, White Sulphur Springs, Greenbrier County, *F. W. Hunnewell*, no. 2712 stam. as *A. neodioica* (F. W. H.).

Antennaria virginica can be distinguished from all varieties of *A. neodioica* by its slenderer stems, shorter, narrower cauline leaves, somewhat smaller involucres, shorter corollas, and by the scarious appendages on the upper cauline leaves of the staminate, and often the pistillate plants. In the latter characteristic, as well as in the shape of the basal leaves, it approaches *A. canadensis*, but differs from that species in the tomentose upper surface of the basal leaves, and in its much smaller involucres and corollas. In its floral characters, both as to size and morphology, *A. virginica* most nearly resembles *A. plantaginifolia*, but it is otherwise totally different, being of the small-leaved group. Typical *A. virginica*, moreover, is set off from all other species of the eastern United States by two charac-

teristics, the erose margins of the involucral bracts, and the sparsely pubescent achenes. It flowers about two weeks earlier than *A. neodioica*, and at the same time as *A. plantaginifolia*.

The typical form is apparently fairly common in dry woods in the Appalachian region of Virginia and West Virginia, wherever the underlying rock is shale, and occurs less commonly outside of the shale areas. The specimens from Vermont and New York are unexpected extensions of its range northward. The former is in every way characteristic of the pistillate plant, even possessing the scarious appendages on the cauline leaves. Although the staminate plant was apparently not collected, in view of its abundance southward, it should be looked for in the vicinity of Middlebury. A collection from New York, dry woods, altitude 2500 ft., Platte Clove, Catskill Mountains, C. S. Williamson, July 10, 1903 (Phila.) may be of this species. The basal leaves, inflorescences, involucres, corollas, and achenes are characteristic, but the cauline leaves are somewhat broader than in the southern material, and the upper ones, along with the upper part of the stems, are covered with red glandular hairs. In this case, also, the staminate plant was not collected.

The extreme of *A. virginica* which is most common on the open shale barrens may be described as

Var. **argillicola** n. var., a forma typica differt foliis basilaribus obovatis, 6–8 mm. latis, apice obtusis vel breviter mucronatis; foliis caulinis apice acutis vel breviter mucronatis, herbaceis; bracteis involucri masculi oblongis vel ellipticis, obtusis, margine integris, lacteis vel roseis; capillis pappi flosculi masculi dilatatis crenatis; involucro femineo 5.5–7 mm. alto; bracteis 0.4–0.8 mm. latis, exterioribus acutis, interioribus attenuatis, margine integris; achaeniis dense pubescentibus.—Pennsylvania: dry, hilly woods, branch of Turkey Foot Run, Sewickley township, Allegheny County, *J. H. Schafer*, July, 1886 stam. (as *A. neodioica*, Pitt.); Moon township, Allegheny County, *Schafer*, no. 263 pist. (as *A. neodioica*, Pitt.). Maryland: Tonoloway Ridge, Washington County, *Shreve and Jones*, no. 768 pist. (as *A. neodioica*, U. S.). Virginia: shale slope, along Gap Run, east of Hayfield, Frederick County, *G. L. Stebbins Jr.*, no. 1035 stam. (G. L. S.); shale slope, Three Top Mountain, Shenandoah County, *F. W. Hunnewell*, no. 11493, in part, stam and pist. (as *A. neodioica*, F. W. H.); same locality, *S. F. Blake*, nos. 11739 stam. and 11740 pist. (S. F. B.); Bull Pasture Mt., Shenandoah Mountains, *P. A. Rydberg*, no. 9004 stam. (as *A. neodioica*, U. S.); dry shale slope in mountains east of Natural Bridge, *E. B. Bartram*, May 31, 1909, pist. (as *A. neodioica*, Phila.). West Virginia: dry woods and roadsides, in shaly soil, Hanging Rock, Hampshire County, *Earl Core, W. M. Frye, and G. L. Stebbins, Jr.*, no. 1033 stam. (G. L. S.); *W. M. Frye*, nos.

1, 2, 8, 10, stam. and pist. The latter number is the TYPE, in the Gray Herbarium, with a duplicate in the U. S. National Herbarium.

The material from Strasburg, Hanging Rock, and Hayfield is most characteristic, the other specimens show some transition toward the typical form.

In the breadth of its basal leaves, the absence of scarious appendages on the cauline leaves, the entire margins of the involucral bracts, and the densely pubescent achenes, var. *argillicola* resembles *A. neodioica.* Furthermore, the involucre of some pistillate plants equals in height that of typical *A. neodioica.* It may be recognized, however, by the short, narrow cauline leaves, and the narrow involucral bracts, as noted in the chart presented below, as well as its smaller size and more densely corymbose inflorescence. Its exterme form is also distinctive in the rounded basal leaves with very short mucros, and in the rose-colored involucres of the staminate plants. These do not occur regularly in any other of the species of eastern America, although they have been reported for *A. plantaginifolia,*[1] and seen by the writer in an immature plant, probably a form of *A. fallax,* collected in the shale area of Virginia.

This species and variety form an interesting addition to the plants of the Appalachian shale area, as studied by Wherry.[2] He has considered at least two of these, *Trifolium virginicum* and *Senecio antennariifolius,* relic species, descendants of ancestors which were widespread in pre-glacial time. *Antennaria virginica* must also be considered an old species compared to its more familiar relatives. As I have pointed out in a previous paper,[3] the cytological evidence shows clearly that the parthenogenetic species of *Antennaria* have been derived from their nearest relatives among the sexual species. *A. virginica,* with its abundant staminate plants, must be sexually reproducing.[4] *A. neodioica* is known to be parthenogenetic, and shows in its specific characteristics that it has been derived from *A. virginica.* It is larger in all of its parts, and blooms later, while staminate plants are rare. These are precisely the characteristics in which the parthenogenetic *A. fallax, A. occidentalis,* and *A. petaloidea* differ from the sexual *A. plantaginifolia* and *A. neglecta.* In the accompanying chart

[1] R. Peabody, RHODORA **36**: 376. 1934.

[2] Jour. Wash. Acad. Sci. **20**: 43–52. 1929; Proc. Penn. Acad. Sci. **7**: 16–164. 1933.

[3] G. L. Stebbins, Jr., Bot. Gaz. **94**: 338–340. 1932.

[4] Since this has gone to press, bagging experiments, like those described in a previous paper (l. c.) have been performed on *A. virginica.* These had negative results, although bagged, but artificially pollinated inflorescences from the same plants produced a good percentage of mature achenes. This demonstrates that *A. virginica* is sexually reproducing, and not regularly parthenogenetic.

and drawings, the chief characteristics of *A. virginica* and its var. *argillicola* are compared with those of *A. neodioica* and its var. *attenuata*, the two varieties which are common within the range of *A. virginica*.

	A. virginica var. typica	A. virginica var. argillicola	A. neodioica var. typica	A. neodioica var. attenuata
Basal Leaves				
Length	average 18–23 mm.	average 15–20 mm.	average 27–33 mm.	average 24–30 mm.
Breadth	av. 4–6 mm.	av. 6–8 mm.	av. 8–9 mm.	av. 9–10 mm.
Apex	acute mucro over 0.5 mm.	obtuse mucro less than 0.5 mm.	obtuse mucro about 0.5 mm.	acute mucro over 0.5 mm.
Cauline Leaves				
Length	average 10–13 mm.	average 11–13 mm.	average 16–19 mm.	average 16–19 mm.
Breadth	1–1.8 mm.	1–2 mm.	2–3 mm.	2–3.5 mm.
Apex	acuminate sometimes scarious	acute	acute	acute-acuminate
Staminate Involucre				
Height	3.8–5 mm. average 4.5	3.8–5 mm. average 4.5	5.5–6.5 mm. average 6	5.5–6.5 mm. average 6
Shape of bracts	elliptic acute	broad-elliptic obtuse	broad obtuse	elliptic obtuse-acute
Pistillate Involucre				
Height	5–6.5 average 6	5–7 average 6.2	6.2–7.5 average 7.2	7–8 average 7.5
No. of bracts	25–35	25–35	35–50	30–40
Apex of bracts	obtuse-acute erose	acute-acuminate, entire	obtuse-acute entire	acute-attenuate slightly erose
Width of outer bracts	0.8–0.9 mm.	0.7–0.8 mm.	1.1–1.4 mm.	0.9–1.1 mm.
No. of florets	40–65	40–70	70–140	50–100
Pistillate Florets				
Length of corollas	3.2–4.2 mm. average 3.6	3.5–4.5 mm. average 3.8	4–5 mm. average 4.2	4.2–5.2 mm. average 4.7
Apex of corollas	mostly regular	irregular	regular	irregular
Pappus hairs	remotely barbellate	closely barbellate	closely barbellate	remotely barbellate
Pits of Receptacle	shallow 0.2 mm. ridges blunt	shallow 0.2 mm. ridges thin, sharp	deep 0.25 mm. ridges blunt	deep, 0.25 mm. ridges thin, sharp

In computing the size of the basal leaves, measurements were taken from the largest leaves of well developed rosettes. The middle cauline leaves only are included in the measurements. The corolla measurements do not include the styles. The apex of the pistillate corolla is considered regular when, as in FIG. 3, its opening is horizontal or nearly so, and the hairs fringing it are about equal in length,

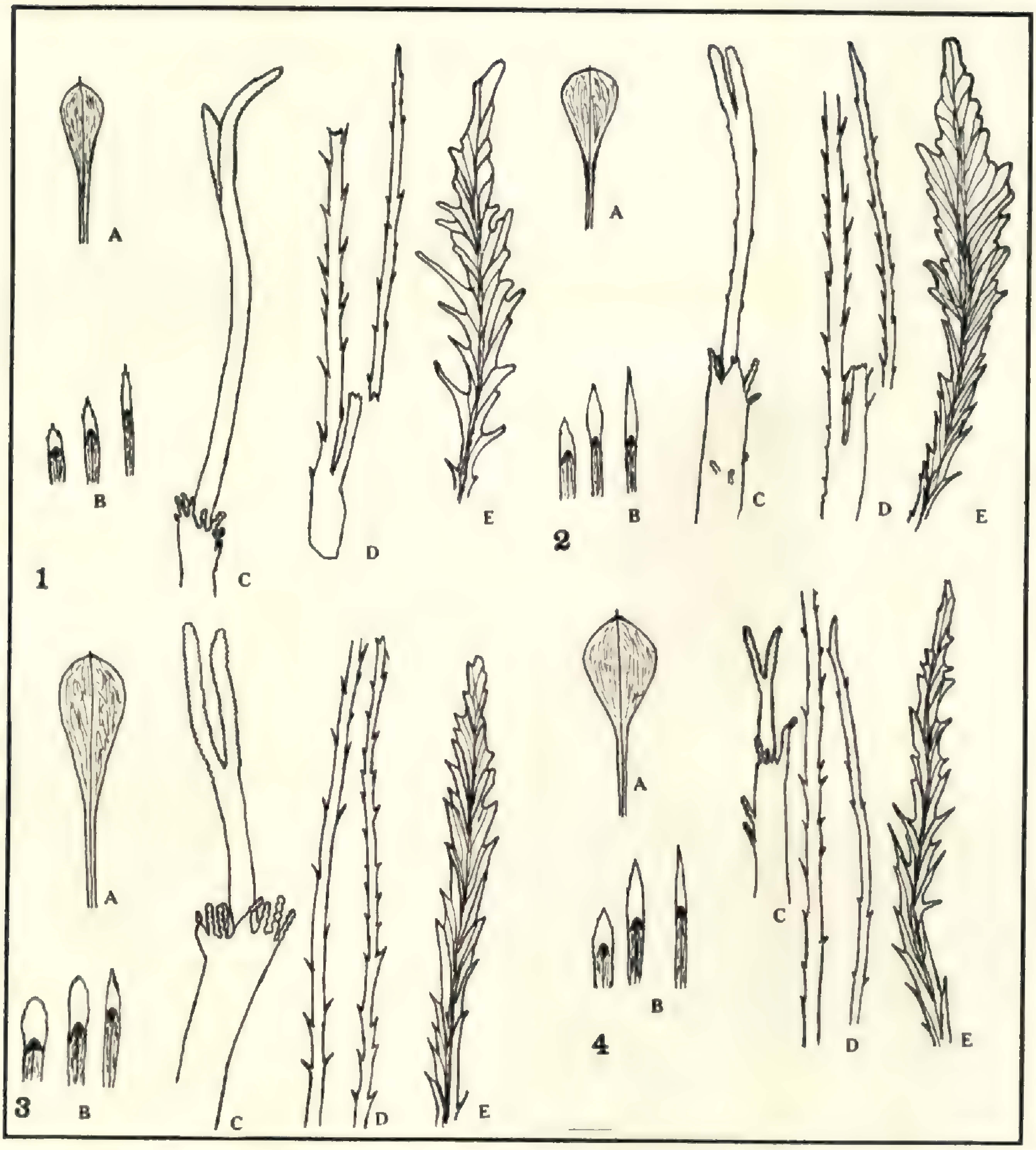


Fig. 1, ANTENNARIA VIRGINICA: A, basal leaf, × ⅘; B, outer, middle and inner involucral bracts, × 2; C, apex of corolla of pistillate floret, × 30; D, base and apex of pappus-hair of pistillate floret, × 30; E, apex of pappus-hair of staminate floret, × 30.

Fig. 2 (A, B, C, D and E), A. VIRGINICA var. ARGILLICOLA, same magnifications.

Fig. 3 (A, B, C, D and E), A. NEODIOICA var. TYPICA, same magnifications.

Fig. 4 (A, B, C, D and E), A. NEODIOICA var. ATTENUATA, same magnifications.

and irregular when, as in FIG. 4, the opening is oblique, or notched, with the hairs markedly unequal in length, and usually a few are situated on the upper part of the limb. FIG. 2 illustrates the closely barbellate pappus hairs of *A. virginica* var. *argillicola,* while the remotely barbellate hairs of *A. neodioica* var. *attenuata* are shown in FIG. 4. From this chart the fact is apparent that the two varieties of *A. neodioica* show different combinations of the characters of the varieties of *A. virginica,* and differ consistently from them only in their larger size throughout. The probability is, therefore, that *A. neodioica* and its var. *attenuata* arose, by increase in the chromosome number and the acquisition of parthenogenesis, from different intermediate forms, presumably hybrids, between *A. virginica* and var. *argillicola.* They probably originated during the period of the Wisconsin glaciation and, due to their greater vigor, ("hybrid vigor" perpetuated by parthenogenesis), and their rapid and certain means of reproduction, advanced over the territory left open by the retreat of the ice sheet, while the parent species remained, for the most part, in its original home south of the limit of glaciation.

A. neodioica var. *grandis* has basal leaves intermediate between those of *A. virginica* and those of *A. plantaginifolia,* and in its looser inflorescence and numerous heads resembles the latter species. The floral characteristics of these three forms are so nearly alike that no definite conclusions can be made concerning them, except that, as expected, *A. neodioica* var. *grandis* is larger in all of its parts than the other two. *A. neodioica* var. *grandis* usually differs from typical *A. neodioica,* as well as from *A. virginica* in the shortness of the hairs at the apex of its corolla, a character which it shares with *A. plantaginifolia.* Furthermore, wherever *A. virginica* and *A. plantaginifolia* have been found together, *i. e.,* at Hanging Rock and at Strasburg, a series of intermediate forms has been collected, which show sterility in the form either of minute and shrunken pollen grains or shrivelled achenes. Some of these intermediate forms (*W. M. Frye,* nos. 1034, 1037, 35, 36; *S. F. Blake,* no. 11732,) are practically identical with *A. neodioica* var. *grandis* except for their small size. There is a complete series of gradations from *A. virginica* to these intermediate forms, just as there is from *A. neodioica* to var. *grandis.* Hence *A. neodioica* var. *grandis* probably originated from these partially sterile hybrids in the manner previously described. Although var. *grandis* is primarily of a more northerly range, I have seen one specimen (Moon Township, Alleghany County, Pennsylvania, *J. H. Schafer,* no. 262)

clearly of this variety, within the range of *A. virginica,* and some of Frye's collections approach it.

The other two recognized varieties of *A. neodioica,* vars. *chlorophylla* and *interjecta,* are more difficult to explain. Var. *chlorophylla* shows a transition toward *A. canadensis,* not only in the green and glabrous upper surface of its leaves, but in the shape of its basal leaves and of the involucral bracts as well, although agreeing with *A. neodioica* in the absence of appendages on the upper cauline leaves, the height of the involucres, and the length of the corollas. If a plant can be found, and certain specimens that I have seen lead me to believe that it exists, which is the sexual counterpart of *A. canadensis* just as *A. virginica* is of *A. neodioica,* then the origin of both *A. canadensis* and *A. neodioica* var. *chlorophylla* could be explained in the same manner as that of the other eastern American species.

Var. *interjecta* is transitional toward *A. rupicola,* a species which, along with *A. gaspensis,* was formerly considered a variety of *A. neodioica,* but whose specific identity is now clearly understood.[1] Both of these latter species are relic endemics of the region about the Gulf of St. Lawrence, except for the isolated occurrence of *A. rupicola* in the Great Lakes region, and show certain resemblances toward some of the Cordilleran species of Antennaria. The likelihood is, therefore, that they have existed since the period before the Wisconsin glaciation, and were evolved at a time when the eastern and the western species of *Antennaria,* now isolated from each other, were mingling together. If this is so, then *A. neodioica* var. *interjecta,* also a relic endemic, of the region about Bic, Que., may be considered a member of this series which approaches more nearly *A. neodioica* and therefore *A. virginica.*

The existence of *Antennaria virginica* is, therefore, further evidence in favor of the hypothesis that the parthenogenetic species of *Antennaria* originated from the sexual species by a process including an increase of the chromosome number and often hybridization.

Colgate University.

[1] Cf. M. L. Fernald, Rhodora 35: 341–343. 1933.

CRITICAL PLANTS OF THE UPPER GREAT LAKES REGION OF ONTARIO AND MICHIGAN

M. L. Fernald

(*Continued from page 222*)

Cryptogramma crispa and C. acrostichoides (Plates 356 and 357).—Having occasion to check as closely as possible the range of the dimorphic fern which in America passes as *Cryptogramma acrostichoides* R. Br. I have become increasingly perplexed to find satisfactory characters to separate it as a species from the European *C. crispa* (L.) R. Br. and the Asiatic *C. Brunoniana* Wallich.

The difficulty is an old one. Robert Brown set up the genus *Cryptogramma*, basing it on the plant brought back by Richardson from the Nelson or the Mackenzie drainage-systems: "In shady rocky woods, between lat. 56° and 60° north. (First found by Mr. Menzies at Nootka Sound)"[1]; but he also included doubtfully with it in the genus the *Pteris crispa* (L.) All., the plant now called *C. crispa* (L.) R. Br. and confined to Europe and adjacent Asia, saying that the European plant differs in having the sori shorter and more rounded, the American with them linear: "Typus generis est Cryptogramma acrostichoides, sed character constructus pro receptione Pteridis crispae *auctor.* quae equidem species, ob soros abbreviatos potius subrotundos quam lineares, venulas terminantes sinum feré involcri occupantes et cito confluentes, tunc aemulantes sorum linearem continuum costae parallelum Pteridis, cum cujus speciebus pinnulis angustatis involucro omnino tectis, habitu bené satis convenit." Kaulfuss, in 1824, reduced *Cryptogtramma acrostichoides*, with doubt, to *Allosorus crispus* (L.) Bernh., basing his reduction on examination of Chamisso's material from Unalaska.

In 1829 Hooker republished Brown's account of *Cryptogramma acrostichoides*, citing first the Menzies collection from Nootka Sound, followed by that of Richardson from the Nelson or the Mackenzie area, and showing typical *C. acrostichoides* in one of Greville's beautiful plates,[2] here reproduced as our plate 356. Referring to Robert Brown's doubt as to the generic identity of the American and the European plants, Hooker said: "To us, however, there appears no generic difference; and the fertile fronds have the closest similarity, in almost every particular, except in the rather shorter *sori* of *capsules*.

[1] R. Br. in Richardson, Frankl. Journ. App. ed. 1: 754, repr. 26, and 767, repr. 39 (1823).

[2] Hook. & Grev. Ic. Fil. i. t. xxix (1829).

In the sterile fronds the pinnules are much broader and never wedge-shaped, in the plant [*C. acrostichoides*] now before us."

Two years later, with a plate (t. clviii), here reproduced as our PLATE 357, Hooker took up a manuscript name of Wallich's for a plant of alpine summits of the Himalayas and published as a new species *Cryptogramma Brunoniana*.[1] The plate of it (our PLATE 357), except for the right-hand sterile frond, might have been drawn from the type-collection of *C. acrostichoides* (our PLATE 356). Note the very similar pinnules of the sterile frond on the left, of *C. Brunoniana*, and those of the Greville plate of *C. acrostichoides*, the essentially identical fertile fronds, the venation of the inrolled pinnules, the enlarged sori and the spores. Although Hooker, following Wallich, intended to compliment Robert Brown in the specific name, the dedication had mixed values:

> Amongst the extensive and valuable collection . . . made by Dr. Wallich . . . , few have given us more pleasure than a species of *Cryptogramma*,—the subject of the present plate,—which was detected on the lofty "Kumaun," a part of the great range of the Himala mountains, by Robert Blinkworth. . . . And this too, though from so very remote a country, is yet *almost* identical with that of Nootka Sound and Subarctic America. The only difference exists in the sterile fronds . . .
>
> Dr. Wallich accompanied the specimens with the remark, "Dedicavi speciem conditori generis immortali, amico aestimatissimo": and we think ourselves honoured in being permitted to give publicity to so interesting a plant, which bears the name of the greatest Botanist of this or any other age or country.

Hooker's dedication, recalling Humboldt's gracious tribute to Robert Brown as "botanicorum facile princeps" everyone could applaud; but, unfortunately, the specific value of *Cryptogramma Brunoniana* was soon doubted by Hooker himself. In his most scholarly work on the ferns, Species Filicum, Hooker in 1858, taking the unjustifiable liberty of changing Brown's *Cryptogramma* to *Cryptogramme*, went further. He boldly reduced both *C. acrostichoides* and *C. Brunoniana* to mere FORMS of the European *C. crispa*. His revocation of the Asiatic and the American species was clearly stated:

> In taking the bold step to unite several supposed species into one, as I have here done, contrary to the judgment of the most distinguished botanists, it is necessary that I offer explanation, especially when, in conjunction with my friend Dr. Greville (Icones Filicum), I published as distinct two of the species I propose to abolish, viz. the N. American *C. acrostichoides*, Br., and the Northern Indian *C. Brunoniana*, Wall. I would however call attention to the remark made, firstly, under *C. acro-*

[1] Wallich in Hook. & Grev. Ic. Fil. ii. t. clviii (1831).

stichoides: "Mr. Brown has drawn up the character of the genus so as to include our *Pteris crispa,* which he nevertheless considers a doubtful species of *Cryptogramme.* To us, however, there appears no generic difference; and the fertile fronds have the closest similarity in almost every particular except the shorter sori (in *C. crispa*). In the sterile fronds the pinnules are much broader, and never wedge-shaped in the plant before us (*C. acrostichoides*)." Under *C. Brunoniana* we observed, "This, though from so remote a country (Himalaya), is yet almost identical with that of Nootka Sound and subarctic America (*C. acrostichoides*); the only difference exists in the sterile fronds," &c. If indeed there was a manifest difference in the sori, so as to constitute different genera, between *C. crispa* and *C. acrostichoides* and *Brunoniana,* as Presl, and lately Mettenius, maintain is the case, the first could upon no account be united with the two latter; but I think I may appeal to the magnified representations of the sori of *C. crispa,* as given in our 'Genera Filicum' and in Fée's 'Genera Filicum,' and of those of the two kinds in the 'Icones Filicum,' in support of my views that there is no available distinction; and I have copious specimens before me at this moment of our British species (*C. crispa*), in proof that, as in *C. acrostichoides,* these sori occupy so much of the veins, and are "ita approximati, ut discus totus pinnulae explanatae capsulis maturis tectus est, et in hoc stadio filix species *Grammitidis* vel *Acrostichi* quasi evadit," *Br.* Our specimens, gathered in an advanced state in Galloway, Scotland, have the involucres quite spreading, and exposing the sori occupying nearly the whole veins.

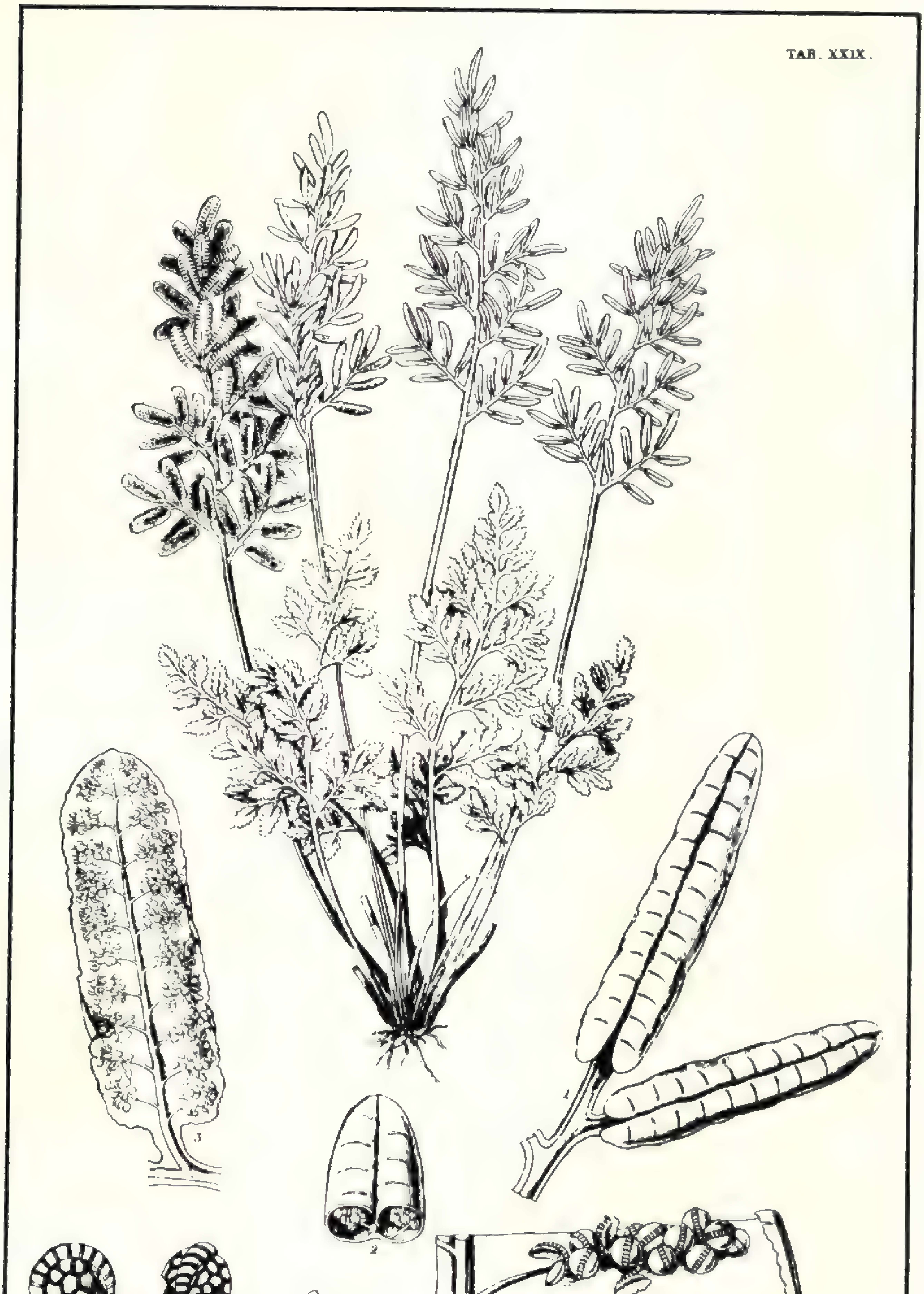
When an old plant is found in a very distant part of the world from its previously known locality, one is apt to look upon it as something new; and, as is the case with the Cedar of Lebanon and the Cedar of Himalaya, it is very difficult to remove the impression once made upon the mind, although no tangible character to distinguish them can be detected.

I shall now consider the different variations or forms of our plant, as much as possible under their respective countries, for I allow that the mass of specimens from Europe, Asia, and America, exhibit some slight differences, often not easily defined.[1]

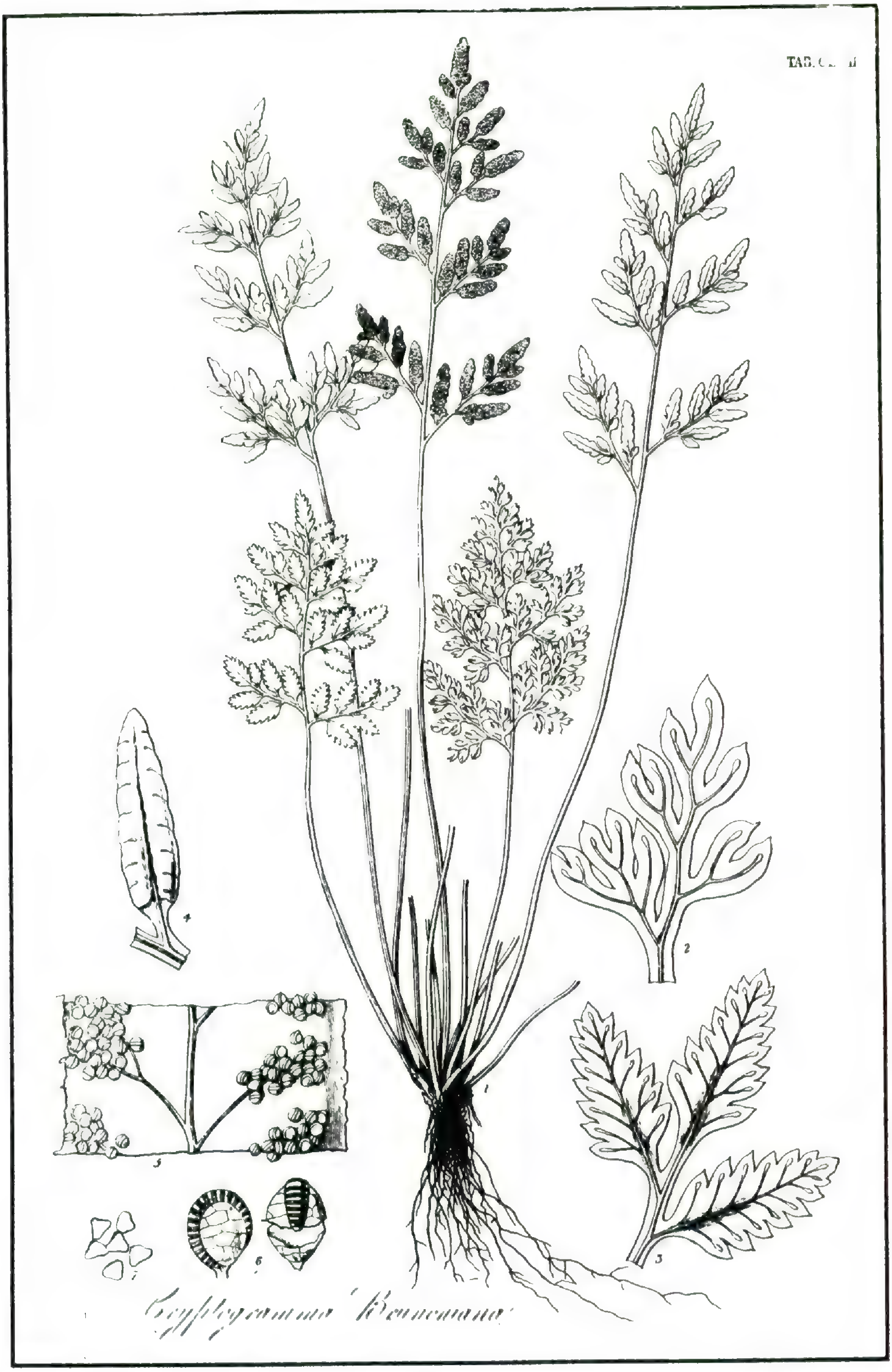
Under his *Cryptogramma crispa,* forma *europaea* he continued

Notwithstanding that our learned friend, Mr. Brown, framed his character of *Cryptogramme* with a view to include our *C. crispa,* "quae dubia quidem species, ob soros abbreviatos potius subrotundos quam lineares," we are disposed to consider it by no means generically distinct, and not even specifically so, either from that gentleman's *C. acrostichoides,* or from the *C. Brunoniana* of Dr. Wallich. It is true that the chief distinction between the plant now under consideration and the two latter is, that *C. crispa* has often the fertile pinnules when mature narrower, with smaller or shorter sori and fewer sporangia, but that is very variable in different specimens, and these sori do not extend and become so completely confluent over the back of the pinnules as generally to force back the involucres, and thus to present a broader surface of pinnule, as is more or less common to the other two kinds; but this is a character not unlikely to depend on soil and climate, and which, in other Ferns, would not be considered of specific, much less of generic value. Another peculiarity in this state of *C. crispa* is, that its habit is more slender than

[1] Hook. Sp. Fil. ii. (pt. v.) 127, 128 (1858).



CRYPTOGRAMMA CRISPA, var. ACROSTICHOIDES (*C. acrostichoides*, after Hooker & Greville).



CRYPTOGRAMMA CRISPA, var. BRUNONIANA (*C. Brunoniana*, after Hooker & Greville).

the continental forms, though even this is by no means universal; some of our specimens are very stout and firm.

Under forma *indica* (*C. Brunoniana*) he made the further note

I place this variety next to the European form, because, in the aggregate of specimens before me, the sterile fronds are exactly as in our European plant, that is, of two kinds, the one kind with the obovate segments deeply divided, serrated, single-nerved, the other with the pinnules elliptical, deeply serrated and pinnatedly veined, whereas the fertile pinnules more resemble those of the following (American) form, although they are not quite so large; but, while the majority of the Indian specimens are as here described, there are others that are more slender and flaccid, with fronds and narrower fertile pinnules, in short, in all particulars resembling our own native specimens.

And in discussing the American plant, his *C. crispa*, forma *americana* (*C. acrostichoides*), Hooker, citing the material of Richardson, Menzies and Douglas, said "The specimens from these stations may be considered the types of the *C. acrostichoides*, Br., and were the first recognized specimens referred to *Cryptogramme;* and they all have the broad, flattened, mature, fertile pinnules, the generally elliptical, rigid, sterile ones." Continuing, he cited the collections from southern Alaska (of Ruprecht, Barclay, Chamisso and Mertens) and made the significant note: "all these, and specimens just received (March, 1857)[1] from J [I]. A. Lapham, Esq., gathered on Isle Royale, Lake Superior, by W. D. Whitney, Esq.,—the only locality known within the United States,—possess quite the European form."

Somewhat earlier, in 1845, Ruprecht,[2] reducing *Cryptogramma* to *Allosorus*, recognized four species in the series now under discussion: *A. crispus* (L.) Bernh. of Europe; *A. foveolatus* Rupr., a renaming, in part, of *Cryptogramma acrostichoides* R. Br., the species said to have the fruiting fronds "valde similis A. crispo," but the sterile coriaceous and opaque, less dissected and with the margins of the upper surfaces strongly foveolate; *A. sitchensis* Rupr. from Sitka, with fronds more divided than in *A. foveolatus* and the foveae not apparent; and *A. Brunonianus* (Wall.) Rupr., the Himalayan plant which he separated from the two American merely by the mucronate pinnules of the sterile fronds ("differt ab A. foveolato et A. sitchensi pinnulis sterilibus mucronatis"). In this connection it should be noted that the conspicuous foveae emphasized by Ruprecht for the commoner American series were specially shown in Greville's plate of the type of *Crypto-*

[1] This item, "March, 1857," is of special significance in view of the date printed on the title-page, "1851."

[2] Rupr. Distrib. Crypt. Vasc. Imp. Ross. in Beitr. Pflanzenk. Russ. Reich. iii. 46, 47 (1845).

gramma Brunoniana. Ledebour[1] accepted Ruprecht's treatment but separated the American plants from the European as a section on the character alleged by Brown, the reputed difference in position of the sori, a "distinction without a difference," as pointed out by Hooker and several later students.

In 1867, without further comment, Hooker & Baker treated[2] *Cryptogramma* as a monotypic species, *C. crispa* R. Br. with two varieties: "β, *C. Brunoniana,* Wall." and "γ, *C. acrostichoides,* R. Br." And other European and Asiatic students of the ferns have expressed similar views. Thus, in 1867, Milde, retaining these plants in *Allosorus,* treated them as one species: *A. crispus* (L.) Bernh., with var. *acrostichoides* (R. Br.) Milde[3] and var. *Brunonianus* (Wall.) Milde. Var. *acrostichoides* was separated along the already emphasized lines, with the addition of the darker median band of the scales ("A forma europaea haec forma differt lamina sterili subcoriacea et segmentis ultimatis ovalibus crenatis, paleis medio coloratis"). However, an Alaskan specimen showed uniformly colored scales and one from the arid subalpine region of Spain had the foliage of the American plant, while even in Silesia plants transitional between the European and American were found ("Formae quae transitum ab europaea ad americanam significant, etiam in Silesia inveni [with citation of illustrations]. Sed multo copiosiores sunt formae ad Brunonianam spectantes, . . . Specimina Kadjakiana [from Kadiak Island, Alaska] paleis fere semper concoloribus, rarissime striolatis gaudebant. In Hispania . . . cl. *Lange* in regione subalpina specimina pusilla Allosori crispa legit, quorum segmenta ultima omnino formam hujus varietatis 'acrostichoides' habent"). Finally, Milde pointed out that the most significant difference is the presence of the conspicuous foveolae on the upper surfaces of the sterile pinnules in vars. *acrostichoides* and *Brunoniana* ("Quam levis momenti foveolae illae in pagina superiore varietatis *acrostichoidis* sint, ex hoc intelligendum est, quod eae quoque in varietate *Brunoniana* saepissime observandae sunt").

In 1880 in his *Review of the Ferns of Northern India,* C. B. Clarke was definite. Reducing *C. acrostichoides* and *C. Brunoniana* to *C. crispa* he said: "I can see no difference between the Himalayan and European plants, nor can I distinguish any Himalayan variety. Milde says the Himalayan form has the barren fronds with the ultimate segments

[1] Ledeb. Fl. Ross. iv. 525 (1853).
[2] Hook. & Bak. Synop. Fil. 144 (1867).
[3] Milde. Fil. Eur. et Atl. 24–26 (1867).

more acutely serrate; but I suspect Milde's stock of Himalayan material on which he ventured this distinction was small. I have collected the plant more than twenty times between Dhurmsala and the Karakorum. None resemble the American var. *acrostichoides*."[1]

In 1881, James Britten made an inconclusive but rather strong argument[2] for uniting all three as one species; in 1884, Boissier definitely treated[3] them all as one. In 1897 Christ[4] made short shrift of the question, treating *Cryptogramma crispa* as a species without varieties, occurring in Europe, Asia and North America; but in 1910[5] he wrote of the Asiatic and the North American plants as "Subspezies: *C. Brunoniana* . . . und in einer dritten: *C. acrostichoides*." In 1907, Hegi, likewise, united[6] them all as one species with Himalayan and American varieties. The latest European estimate of the three comes from Christensen in 1927. Writing of the Kamtchatkan plant, he calls it the American *C. acrostichoides*, but with the pertinent note:

> The beautiful specimens agree closely with the species quoted above, which was previously not known from Asia. The differences between it and the European *C. crispa* are so small that I am inclined, like MILDE, to consider it a variety of *C. crispa*. Specimens collected, for instance, at Lofoten (Svolvaer), without doubt belonging to *C. crispa*, can scarcely be distinguished from *C. acrostichoides*. The best characters of this species show the basal scales, which are dark-brown in the centre (in *C. crispa* concolorous) and the small pits (faveolae — conf. the syn. *Allosurus faveolatus* RUPR.) on the upper side of the lamina above the tips of the veins; they are probably to be found only in dried specimens.[7]

In American treatments I find little or no reflection (except by George Lawson, whose viewpoint was essentially European) of the judgments of Hooker, Milde, Clarke and Christensen, that *Cryptogramma acrostichoides* is a geographic variety of *C. crispa*. With the works of Hooker and of Milde before him D. C. Eaton wrote, in 1880, of the American *C. acrostichoides* and the European *C. crispa:*

> The two plants are in fact so nearly allied that Hooker and Milde have considered the American only a variety of the European, and Hooker said that some of the Scottish specimens in his collection were almost identical with those from North America, and that he had some from the United States and from British Columbia quite agreeing with the common European form. While it is indisputable that there may be specimens from one continent much resembling the type usually seen in the other,

[1] C. B. Clarke, Trans. Linn. Soc. ser. 2, Bot. i. 459, 460 (1880).
[2] Britten, Europ. Ferns, 57–63 (1881).
[3] Boissier, Fl. Orient. v. 726 (1884).
[4] Christ, Farnkr. der Erde, 157 (1897).
[5] Christ, Geogr. der Farne, 123 (1910).
[6] Hegi, Ill. Fl. Mitteleur, i. 36 (1907).
[7] Christensen in Hultén, Fl. Kamtch. and Adj. Isl. i. 43 (1927), where Christensen unjustifiably altered the spelling of *Allosorus foveolatus* to *A. faveolatus*.

yet the normal type of *C. acrostichoides* is so different from that of *C. crispa*, that, for the present purpose certainly, it is better to keep them apart.[1]

Eaton's treatment of the admittedly confluent plants of the two continents as two species, in spite of the inconstancy of the characters, has, apparently, been quite satisfactory to all American botanists. I can find no American treatment (except Lawson's in 1889) of it as a variety of *Cryptogramma crispa*. This is perhaps due to lack of sufficient Old World material for proper comparisons in many American herbaria or merely to the fact that attention has not been focussed on the question. We freely admit other circumboreal types, even though the American plants may often show well defined varietal differences: *Botrychium Lunaria, Cystopteris fragilis, Thelypteris Phegopteris* and *T. fragrans, Polystichum Lonchitis* and *P. Braunii, Athyrium Filix-femina* and *alpestre, Asplenium viride* and *septentrionale, Phyllitis Scolopendrium, Lycopodium annotinum, Selaginella selaginoides* and many others. Why, in view of the evidence, discriminate against *Cryptogramma crispa?*

The preceding summary of the conclusions of Hooker, Milde, Clarke, Christensen and others regarding the breaking down of specific lines between *Cryptogramma crispa*, at one end of the series, and *C. acrostichoides* at the other, was prepared after a personal study of the material had convinced me of the specific identity. In my own study of the material I had detected and correlated the characters which, to my great satisfaction, I find that others before me and with a tremendous advantage of experience and fuller material have already pointed out. The disrupted range (MAP 12) of the aggregate species, *C. crispa*, is such as to indicate that its geographic segregation was an early one. The three geographic varieties are indicated in the following synopsis.

Sterile fronds submembranaceous to subcoriaceous, when dry translucent to transmitted light, clearly displaying the nerves; nerve-tips not conspicuously foveolate; pinnules chiefly cuneate at base and deeply cleft: fertile fronds quadripinnate to bipinnate, with 35–200+ pinnules 0.2–1 cm. long: basal scales mostly concolorous, pale to full brown . . . . *C. crispa*, var. *typica*.

Sterile fronds chartaceous to coriaceous, opaque; nerve-tips (at least in dried specimens) conspicuously foveolate: fertile fronds bipinnate or tripinnate, with 25–115 pinnules 0.2–2 cm. long: basal scales mostly with median castaneous center, or concolorous.

Some or all of the sterile fronds with cuneate-obovate or subflabelliform deeply cleft pinnules: fertile pinnules 25–85, 0.2–1.1 cm. long; basal scales mostly pale and concolorous. Var. *Brunoniana*.

[1] D. C. Eaton, Ferns of N. Am. ii. 102 (1880).

Photo. E. C. Ogden.

Pteridium aquilinum, var. lanuginosum, forma decipiens, × 3/5, from Quebec.

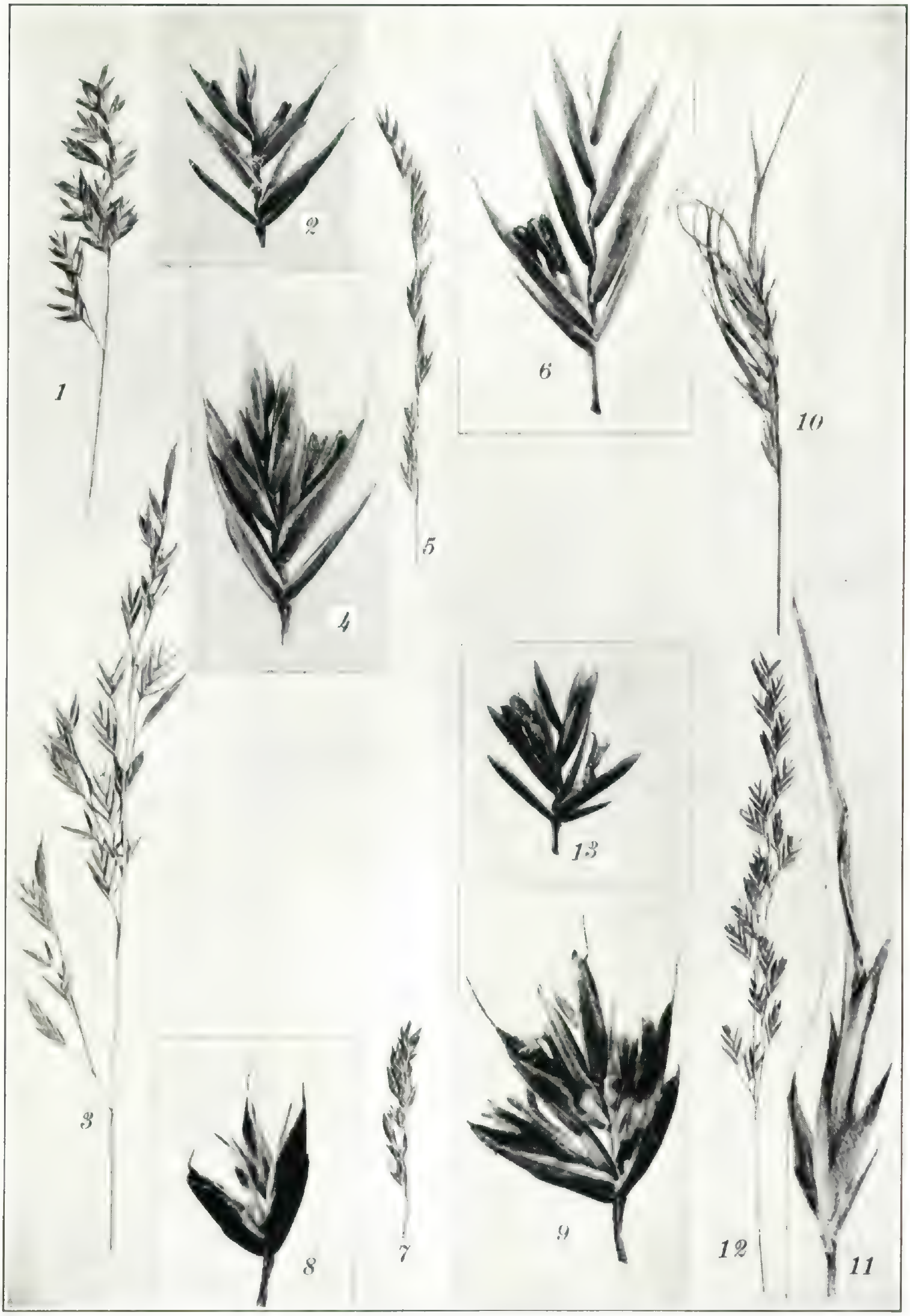
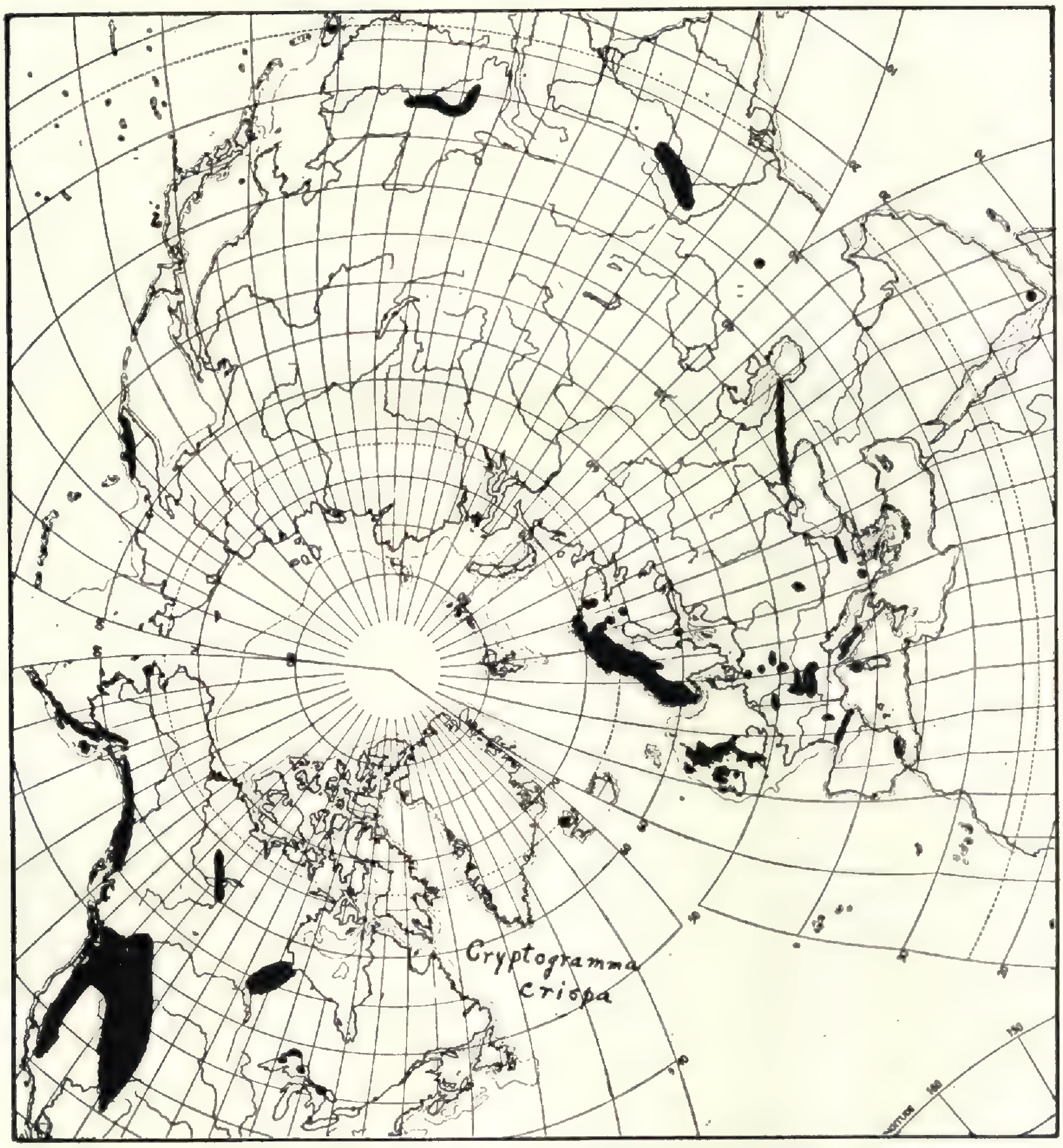


Photo. E. C. Ogden.

FESTUCA OVINA AND ALLIES IN EASTERN AMERICA: FIGS. 1 and 2, F. OVINA; 3 and 4, F. OVINA, var. DURIUSCULA; 5 and 6, F. SAXIMONTANA; 7 and 8, F. BRACHYPHYLLA; 9, F. SUPINA; 10 and 11, F. VIVIPARA; 12 and 13, F. CAPILLATA; panicles, × 1; spikelets, × 5.

All the sterile fronds with oblong or narrowly ellipitic crenate to incised pinnules: fertile pinnules 25–115, mostly 0.4–2 cm. long: basal scales mostly with casteneous centers. . . . . Var. *acrostichoides.*

C. CRISPA (L.) R. Br., var. **typica.** *Osmunda crispa* L. Sp. Pl. ii. 1067 (1753). *Pteris crispa* (L.) All. Fl. Pedem. ii. 284 (1785). *Acrostichum crispum* (L.) Vill. Hist. Pl. Dauph. iii. 838 (1789). *Polypodium crispum* (L.) Roth, Usteri Neu. Ann. ii. 10 Stück. 56 (1794).



MAP 12. World-Range of CRYPTOGRAMMA CRISPA.

Onoclea crispa (L.) Hoffm. Deutschl. Fl. ii. 11 (1795). *Allosorus crispus* (L.) Bernh. in Schrad. Neu. Journ. 1². 36 (1806). *Blechnum crispum* (L.) Hartm. Handb. Skand. Fl. 372 (1820). *Stegania onocleoides* S. F. Gray, Nat. Arr. Brit. Pl. ii. 16 (1821). *Phorolobus crispus* (L.) Desv. Prodr. 291 (1827). *Struthiopteris crispa* (L.) Wallr. Fl. Cr. Germ. i. 27 (1831). *C. crispa* (L.) R. Br. in Richardson, Frankl. Journ. App. ed. 1: 767, rep. 39 (1823) by implication but without

transfer; Hook. & Bauer, Gen. Fil. t. cxv B (1842), where ascribed to Brown.—Europe and adjacent Asia.

Var. **Brunoniana** (Wallich), comb. nov. *C. Brunoniana* Wallich in Hook. & Grev. Icon. Fil. ii. t. clviii (1831); Beddome, Ferns Brit. Ind. t. clxiv (1868). *Gymnogramma Brunoniana* (Wall.) Presl, Tent. 219 (1836). *Allosorus Brunonianus* (Wall.) J. Smith, Journ. Bot. iv. 49 (1841). *Phorolobus Brunonianus* (Wall.) Fée, Gen. 131 (1850–52). *C. crispa,* forma *indica* Hook. Sp. Fil. ii. 129 (1858). *C. crispa,* β, *C. Brunoniana* (Wall.) Hook. & Baker, Syn. Fil. 144 (1867). *Allosorus crispus,* var. *Brunonianus* (Wall.) Milde, Fil. Eur. et Atl. 25 (1867). *C. crispa,* subsp. *C. Brunoniana* (Wall.) Christ, Geogr. der Farne, 123 (1910).—Alpine regions of the Himalayas; mountains of southern China; ? Japan. A few specimens, not wholly characteristic and with the castaneous scales and other characters transitional to the next, in southern Alaska, are referred as transitional to the next. They may include Ruprecht's proposed species. Plate 357.

Var. acrostichoides (R. Br.) C. B. Clarke, Trans. Linn. Soc. ser. 2, i. 460 (1880); Lawson, Fern Fl. Can. 236 (1889). *C. acrostichoides* R. Br. in Richardson, Frankl. Journ. App. ed. 1: 754, repr. 26, 767, repr. 39 (1823); Hook. & Grev. Ic. Fil. t. xxix. (1831); D. C. Eaton, Ferns N. Am. ii. 99, t. lix. figs. 1–5 (1880); Christensen in Hultén, Fl. Kamtch. and Adj. Isl. i. 43 (1927). *Allosorus foveolatus* Rupr. Distr. Crypt. Vasc. Imp. Ross. in Beitr. Pflanzenk. Russ. Reich. iii. 46 (1845). *A. sitchensis* Rupr. l. c. 47 (1845). *C. crispa,* forma *americana* Hook. Sp. Fil. ii. 130 (1858). *C. crispa,* γ, *C. acrostichoides* (R. Br.) Hook. & Baker, Syn. Fil. 144 (1867). *A. crispus,* var. *acrostichoides* (R. Br.) Milde, Fil. Eur. et Atl. 24 (1867). *C. acrostichoides,* forma *foveolata* (Rupr.) Gilbert, List N. Am. Pterid. 16 and *C. acrostichoides foveolata* (Rupr.) Gilbert, l. c. 36 (1901), the latter repeatedly spoken of as "a variety," and "this variety," although on the earlier page it was called a forma! *C. crispa,* subsp. *C. acrostichoides* (R. Br.) Christ, Geogr. der Farne, 123 (1910).—Kewatin to Alaska and Kamtchatka, south, locally, to islands of Lake Huron, Ontario, of Lake Superior, Ontario and Michigan, and along the mountains to New Mexico and southern California. Plate 356.

In its very thick and opaque fronds, as compared with the submembranaceous and translucent fronds of the European *Cryptogramma crispa,* our var. *acrostichoides* shows the result of long-continued growth in the drier region of North America as contrasted with the generally more humid western Eurasia. Var. *acrostichoides* is stated to grow in Labrador (Britton & Brown); and Macoun (Cat. Can. Pl.) seems to quote Hooker as assigning it to "Rocks along the Arctic coast from Mackenzie River to Baffin Bay." I have not seen it from Labrador nor from within the Arctic Circle, nor can I trace Macoun's statement ascribed to Hooker. Ostenfeld did not know of it in Flora Arctica; neither did Simmons in his extensive studies of the Arctic

American flora. European authors have designated some other and later Old World varieties, which I have not been able to study; also one from Chile, which is open to serious doubt.

Pteridium aquilinum (L.) Kuhn. var. **lanuginosum** (Bong.), comb. nov. *Pteris aquilina*, var. *lanuginosa* Bong. Mém. Acad. St. Pétersb. sér. 4, ii. 176 (1832). *Pteridium aquilinum*, var. *pubescens* Underw. Our Native Ferns, ed. 6: 91 (1900). *Pteris aquilina pubescens* (Underw.) Clute, Fern. Bull. xv. 124 (1907). *Filix-foemina aquilina* (L.) Farwell, var. *lanuginosa* (Bong.) Farwell, Am. Midl. Nat. xii. 290 (1931).

When Underwood published *Pteridium aquilinum*, var. *pubescens* in 1900 he was working under one of the so-called American rules which rejected a name if it repeated one ever used under the genus in any category. Consequently, since there had been a *Pteris lanuginosa* Bory (1810), Underwood rejected Bongard's varietal name (1832). Under the International Rules the latter must be retained.

Pteridium aquilinum, var. *lanuginosum* is the common bracken of western North America, from Alaska to California, Arizona, New Mexico and the high mountains of western Texas, south along the mountains to Guatemala, with an eastward extension into the Black Hills of South Dakota. East of the Black Hills it is highly localized: on the Gaspé Peninsula, where the cordilleran relationship is well known, the Gaspé plant being the basis of Lawson's *Pteris aquilina*, γ. *decipiens;* on the serpentine slopes and high crests near Black Lake, Megantic Co., Quebec (*Fernald & Jackson*, nos. 11,690 and 11,691), a region famous, also, for its remarkably localized relic-colonies of cordilleran plants (*Adiantum pedatum*, var. *aleuticum* Rupr., *Pellaea densa* (Brack.) Hook., *Festuca scabrella* Torr., etc.); and at Tobermory, at the tip of the Bruce Peninsula, another area famous for its isolated colonies of apparently relic species. Its other area eastward is in northern Michigan. The following Michigan specimens are in the Gray Herbarium: shore of Lake Superior, *C. T. Jackson;* Mackinac Island, *C. F. Wheeler*, no. 85; openings and thickets back of West Bluff, Keweenaw Co., *Fernald & Pease*, no. 3033. In the Gray Herbarium there are specimens reputed to come from New Jersey and Pennsylvania; their data, entered second-hand, is open to grave doubt. See p. 205

The plant described by Lawson from Gaspé as *Pteris aquilina*, γ *decipiens* is a remarkable form. Conventially, *Pteridium aquilinum* is characterized by its conspicuously deltoid frond. Lawson's account of his remarkable plant follows.

Pteris aquilina, Linn. . . . γ. *decipiens*.—Frond bipinnate, thin and membranous, lanuginose, pinnules pinnatifidly toothed, or, in small forms, entire, barren; L'Anse à Cabièlle, Gaspé, John Bell, B. A. This is a very remarkable fern, resembling a Lastrea, and in the absence of fructification, it is doubtfully referred to *Pteris aquilina*, yet the venation seems to indicate that it belongs to that species. . . . Being at a loss what to make of this fern, I sent it to Mr. D. C. Eaton, M. A., who is justly looked up to by American botanists as our best authority on American ferns, and he likewise failed to recognize it. I hope some visitor to Gaspé will endeavuor to obtain it in a fertile state, and thus relieve the doubt.*

* Since the above was written, I have had an opportunity of studying the forms and development of *Pteris aquilina*, and am quite satisfied that the doubtful plant is a state of that species, not old enough to be fertile.

Although Lawson's hope that some one would secure fertile plants from Gaspé of his *Pteris aquilina*, γ. *decipiens* was not fulfilled before his death, material (PLATE 358) which, unquestionably, belongs with it was collected by my former student, Dr. H. B. Jackson, and myself near the crest of Caribou Hill in Megantic Co., Quebec. There, as already noted, it is associated with a remarkable assemblage of relic-colonies of cordilleran plants. It is, therefore, significant that the Caribou Hill plant should have the ciliate indusium and the pubescence which characterize the cordilleran *Pteridium aquilinum*, var. *lanuginosum*. Another number from Caribou Hill is less unlike typical var. *lanuginosum*. It is, therefore, better to treat the plant with bipinnate fronds "resembling a Lastrea" as a form rather than as a true geographic variety. Mr. Ogden has photographed two of the fronds, × 3/5, of the fertile material from Caribou Hill (PLATE 358). Their superficial resemblance to *Thelypteris* (*Lastrea*) *marginalis* (L.) Neiuwl. is apparent. This form should be called

PTERIDIUM AQUILINUM, var. LANUGINOSUM, forma **decipiens** (Lawson), comb. nov. *Pteris aquilina*, γ. *decipiens* Lawson. Edinb. New Phil. Journ. n. s. xix. 110 (1864).—reprinted as Syn. Canad. Ferns and Filic. Pl. 11 (1864). Known only locally in Quebec. PLATE 358.

LYCOPODIUM SELAGO L., var. PATENS (Beauv.) Desv. MICHIGAN: glades and openings in thicket bordering calcareous beach of Lake Michigan, east of Manistique, Schoolcraft Co., no. 3060.

The only Michigan station for *L. Selago* cited by Dodge, is Farwell's in Keweenaw Co. Robbins got typical *L. Selago* in 1863 at Dana Mine, ?Keweenaw Co. (Gray Herb.) and Cooper got it on Isle Royale.

SELAGINELLA SELAGINOIDES (L.) Link. Cited for Michigan by Dodge only from Isle Royale and from Keweenaw Co., Upper Peninsula; reported by Gates & Ehlers from Emmet Co. The following additional stations are represented in the Gray Herbarium from MICHIGAN: Marquette Island, Mackinac Co., August 27, 1913, *W. H.*

Manning; Mackinac, August, 1885, *T. E. Boyce;* shore of Thunder Bay Island, Alpena Co., July 18, 1885, *C. F. Wheeler;* glades and openings in thicket bordering calcareous beach of Lake Michigan, east of Manistique, Schoolcraft Co., no. 3061.

POTAMOGETON OAKESIANUS Robbins. MICHIGAN: with *Eleocharis Robbinsii* Oakes, *Utricularia geminiscapa* Benj., *Eriocaulon septangulare* With. and *Drosera intermedia* Hayne in pools in a bog near Rock River, Alger Co., no. 3066.

Reported by Oosting (Pap. Mich. Acad. xv. 159) from a number of counties in the Lower Peninsula and Gogebic in the Upper Peninsula.

PANICUM DEPAUPERATUM Muhl., var. PSILOPHYLLUM Fern. When I described this glabrous-sheathed variety, RHODORA, xxiii. 193 (1921), I had not seen it from Michigan. The following collections establish its presence on the Upper Peninsula: sandy barrens west of Norway, Dickinson Co., no. 3068; sandy open pine barrens north of Gladstone, Delta Co., no. 3072.

PANICUM LINEARIFOLIUM Scribn. The broad range, "Maine to Kansas, south to Georgia and Texas" given by Hitchcock & Chase, excludes the region north of Lake Huron. Our collection from dry gneiss hills, Awrey, Sudbury District, ONTARIO, no. 3069, is from north of the Lake.

P. LINEARIFOLIUM, var. WERNERI (Scribn.) Fern. (*P. Werneri* Scribn.) The range given by Hitchcock & Chase is extended slightly northward. ONTARIO: dry gneiss hills east of Wasapitei, no. 3070. MICHIGAN: dry, open pine woods, Bête Grise, Keweenaw Co., no. 3071.

P. LANUGINOSUM Ell., var. LINDHEIMERI (Nash.) Fern. (*P. Lindheimeri* Nash). The northernmost stations cited by Hitchcock & Chase for Ontario and Michigan give no indication that the plant extends into the northern half of the Lake Huron region. The following collections represent this area. ONTARIO: calcareous gravel by pools, Cloche Peninsula, Manitoulin District, no. 3077; sandy shore of Lake Huron, Algoma, Algoma Distr., no. 3076. MICHIGAN: sandy and stony beach of Lake Huron, south of Alpena, no. 3082.

P. COLUMBIANUM Scribn. (Including *P. tsugetorum* Nash). The broad range given by Hitchcock & Chase (for *P. tsugetorum*), "Maine to Illinois," etc., excludes northern Ontario and the Upper Peninsula of Michigan. The following collections show its occurrence there. ONTARIO: dry gneiss hills east of Wasapitei, Sudbury Distr., no. 3073, and dry sandy plains and barrens, Espanola, Sudbury District, nos. 3074, 3075. MICHIGAN: sandy, open pine barrens north of Gladstone, Delta Co., no. 3080.

ORYZOPSIS CANADENSIS (Poir.) Torr. (*Stipa canadensis* Poir.). ONTARIO: dry sandy plains and barrens, Espanola, Sudbury Distr., no. 3090. MICHIGAN: dry spruce and pine barren near Humboldt, Marquette Co., no. 3089.

Previously known from east of Georgian Bay and from the north shore of Lake Superior, Ontario.

Stipa spartea Trin. Ontario: sandy shore of Lake Huron, Algoma, Algoma Distr., no. 3092.

Previously known on the southern and eastern shores of Lake Huron as far as the tip of Bruce Peninsula: Tobemory, *Krotkov*, no. 7135.

Melica Smithii (Porter) Vasey. The measurements given by Hitchcock in Gray, Man. ed. 7, should be extended, in view of our new collections from northern Michigan: culms up to 1.5 m. high; blades to 1.5 cm. broad; panicle to 4.3 dm. long; spikelets to 2.4 cm. long (and down to only 1 cm. long). See p. 218 and map 11.

Poa sylvestris Gray. Michigan: woods south of L'Anse, Baraga Co., no. 3111.

Near, if not its northern limit in the state.

The Allies of Festuca ovina in eastern America (Plate 359).—The members of the *ovina* series in eastern North America (separated from the *rubra* series by having the lower sheaths mostly whitish or drab, chartaceous, persistent, not soon disintegrating into fibers; new basal offshoots strongly ascending, from within the sheaths; anthers ¼–½ as long as the palea) are distinguished by the following characters.

a. Lemmas coriaceous to membranaceous, with awns at most 3 mm. long (or wanting); ovaries glabrous; panicles strict, rarely 1 dm. long. . . . *b.*
- *b.* Awns 1. 3–3 mm. long. . . . *c.*
  - *c.* Panicle loosely open, with divergent short branches during anthesis, oblong to ellipsoid; lemmas coriaceous, strongly involute; anthers 2.5–3 mm. long.
    - Culms 1.5–3 (–6) dm. high; leaves 0.4–0.6 mm. in diameter, 5–7-nerved; panicles 2–5 cm. long; spikelets 5–7 mm. long, 3–6-flowered; 2d glume 2.5–4 mm. long; lowest lemma 3–5 mm. long . . . . *F. ovina.*
    - Culms up to 7 dm. high; leaves 0.7–1.2 mm. broad, 7–9-nerved; panicles 4–10 cm. long; spikelets 7–10 mm. long, 4–9-flowered; 2d glume 3.5–5 mm. long; lowest lemma 4.5–6 mm. long . . . . *F. ovina,* var. *duriuscula.*
  - *c.* Panicle spiciform and close or loosely linear-cylindric to loosely lanceolate; anthers less than 2 mm. long.
    - Panicle linear-cylindric or loosely lanceolate, 2–10 cm. long; lemmas greenish, coriaceous, strongly involute; anthers 1.2–1.7 mm. long . . . . *F. saximontana.*
    - Panicle dense, closely spiciform at least above, cylindric to lance-ovoid, usually 1–3 cm. long; lemmas purplish or bronze, membranaceous, tardily, if at all, involute; anthers 0.5–1 mm. long . . . . *F. brachyphylla.*
- *b.* Awnless or with awns at most 0.6 mm. long.
  - Florets modified into leafy proliferous shoots; 2d glume 3–5 mm. long; lemmas membranaceous, not strongly inrolled, 4–6 mm. long; stamens wanting . . . . *F. vivipara.*

Florets normal, perfect; 2d glume 2–2.7 mm. long; lemmas coriaceous, tightly inrolled, 3–3.5 mm. long; anthers 1.5–2 mm. long . . . . *F. capillata.*

a. Lemmas membranaceous, 5–6.5 mm. long, with awns 2.5–7 mm. long; ovary pubescent at summit; panicle lax, flexuous, mostly 1–2.5 dm. long . . . . *F. occidentalis.*

F. OVINA L. Sp. Pl. i. 73 (1753).—Eurasian; introduced in North America, and naturalized in dry soils, from Quebec to western New York and New Jersey. FIGS. 1 and 2.

Forma HISPIDULA (Hack.) Holmb., Scand. Fl. hft. ii. 234 (1926) (*F. ovina*, var. *vulgaris*, subvar. *hispidula* Hack. Mon. Fest. Eur. 87 (1882)) has hispid lemmas.

Var. DURIUSCULA (L.) Koch, Syn. 812 (1857). *F. duriuscula* L. Sp. Pl. 74 (1753).—More frequent, Newfoundland to Minnesota and Pennsylvania. FIGS. 3 and 4.

F. SAXIMONTANA Rydb. Bull. Torr. Bot. Cl. xxxvi. 536 (1909). *F. ovina*, var. *pseudovina* Beal, Grasses, N. Am. ii. 595 (1896), not *F. pseudovina* Hack. (1880). *F. pseudovina* Rydb. Mem. N. Y. Bot. Gard. i. 56 (1900), not Hack. (1880).—Dry crests, hills and sands, western Newfoundland; eastern Quebec; Smugglers Notch, Vermont; shores of Lake Huron, Ontario to British Columbia, south to Michigan, Wisconsin, Minnesota, Nebraska, Colorado and Utah. FIGS 5 and 6.

F. BRACHYPHYLLA Schultes, Man. iii. 646 (1827). *F. brevifolia* R. Br. App. Parry's Voy. Suppl. 289 (1824), not Muhl. (1817). *F. ovina*, var. *brevifolia* (R. Br.) Hack. Bot. Centralb. viii. 406 (1881). *F. ovina brachyphylla* (Schultes) Piper, Contr. U. S. Nat. Herb. x. 27 (1906). *F. supina* Am. Auth., not Schur (1866). *F. ovina supina* Piper, l. c. (1906), in part, not (Schur) Hack. (1881).—Greenland and arctic America, south to bleaker areas of Labrador, northern and western coast and mountains of Newfoundland, Anticosti Island and Shickshock Mts., Quebec, Keweenaw Co., Michigan, and alpine regions to Colorado, Utah, Nevada and California. FIGS. 7 and 8.

Although the arctic-alpine American plant is often passing as the central European *Festuca supina* Schur, it is very different, as worked out in the Gray Herbarium by my former student, now Dr. Ernst Abbe, when identifying his Labrador material. *F. supina* (FIG. 9) has anthers 2–3 mm. long, while the arctic-alpine American plant has them minute (0.5–0.8, rarely –1 mm. long). FIG. 9 is from *Petrak*, Fl. Bohemiae et Moraviae Exsicc. Lfg. VIII. no. 717, from near the type locality of *F. supina*.

F. VIVIPARA (L.) Sm. Fl. Brit. i. 114 (1800); Fernald, RHODORA, xxviii. 151 (1926). *F. ovina*, β, *vivipara* L. Sp. Pl. ed. 2, i. 108 (1762).—Arctic regions, south to mts. of Europe; in America from Greenland and Labrador to northern and western Newfoundland, Anticosti Island and Shickshock Mts., Quebec. FIGS. 10 and 11.

F. CAPILLATA Lam. Fl. Fr. iii. 597 (1778). *F. tenuifolia* Sibth. Fl.

Oxon. 44 (1794). *F. ovina*, var. *capillata* (Lam.) Hack. Bot. Centralb. viii. 405 (1881).—European; indigenous on dry open soil in southern Newfoundland, apparently also in Nova Scotia; introduced and naturalized westward to Michigan and south to Pennsylvania. Figs. 12 and 13.

F. occidentalis Hook. Fl. Bor. Am. ii. 249 (1840); Piper, Contrib. U. S. Nat. Herb. x. 24, pl. viii. (1906). *F. ovina*, var. *polyphylla* Beal, Grasses N. Am. ii. 597 (1896).—British Columbia to California, eastward to western Montana and northwestern Wyoming; woodlands of northern Michigan and adjacent Ontario eastward to Manatoulin Island and Bruce Peninsula.

Piper's diagnostic plate is so good that it is not necessary to illustrate this species.

Agropyron trachycaulum (Link) Malte. Ontario: limestone pavement and gravel, Great Cloche Island, no. 3141.

When I published on this group (Rhodora, xxxv. 170) the typical form of the species was unknown to me from between Lake Superior and the lower St. Lawrence. Its occurrence on the recently exposed beach of Great Cloche Island suggests that it may be more widely spread about Lake Huron.

Scirpus Clintonii Gray. Michigan: dry sandy plains near Driggs, Schoolcraft Co., no. 3153.

The only stations recorded by Beal are on the Lower Peninsula.

Rynchospora capillacea Torr., forma **leviseta** (E. J. Hill), comb. nov. *R. capillacea*, var. *leviseta* E. J. Hill ex Gray, Am. Nat. x. 370 (1876). *Phaeocephalum capillaceum* (Torr.) Farwell, var. *levisetum* (E. J. Hill) Farwell, Report Mich. Acad. Sci. xxi. 361 (1920).

The form with smooth instead of retrorsely barbellate bristles is interesting and worthy a designation, but it has no distinctive range, colonies of it occurring here and there through the broad range of the less localized typical *Rynchospora capillacea*. It is better considered a forma rather than a geographic variety. When it was first published, as noteworthy for its "*perfectly smooth*" bristles, it was clearly stated that "Except in this remarkable particular the plant appears to be undistinguishable from *R. capillacea*." Many subsequent collections strengthen this assertion.

Carex praegracilis W. Boott. (*C. marcida* Boott, 1839, not J. F. Gmel., 1791). Michigan: forming dense carpets in damp sand, Eagle Harbor, Keweenaw Co., no. 3158.

A species of western North America (also South America) primarily of the cordilleran and Great Plains regions, from Yukon to central Mexico, heretofore known as an indigenous plant eastward to Mani-

Photo. E. C. Ogden.

CAREX GARBERI: FIG. 1, small plant, × 1; FIG. 2, orifice of sheath, × 5; FIG. 3, spike, × 5; FIG. 4, staminate scales, × 5; FIG. 5, denuded rachis, × 10; FIG. 6, perigynium, × 10.

C. GARBERI, var. BIFARIA: FIG. 11, portion of plant, × 1; FIG. 12, perigynium, × 10.

C. HASSEI: FIG. 7, spike, × 5; FIG. 8, staminate scales, × 5; FIG. 9, orifice of sheath, × 5.

C. AUREA: FIG. 10, portion of spike, × 5.

Photo. E. C. Ogden.

ZIGADENUS GLAUCUS: FIG. 1, flowering plant, × ⅖; FIG. 2, portion of inflorescence, showing firm bracts, × 2; FIG. 3, capsule, × 2.

Z. ELEGANS: FIG. 4, flowering plant, × ⅖; FIG. 5, portion of inflorescence, showing scarious bracts, × 2; FIG. 6, capsule, × 2.

toba, Minnesota and Iowa (Mackenzie, N. Am. Fl.). The Eagle Harbor colony is certainly indigenous, in damp depressions in the typical barrens of *Pinus Banksiana*.

C. Hookerana Dewey. Ontario: roadside, Schreiber, Thunder Bay District, *Pease & Bean*, no. 23,599.

Another species of the plains and prairies now extended eastward, from Manitoba and North Dakota, to the Lake Superior region. As noted in N. Am. Fl. the specific name was published by Dewey as *Hookerana* (not *Hookeriana* to which it has usually been altered). Dewey's material from Carlton House (type in Gray Herb.) is distinctly called "*C. Hookerana* D."

C. exilis Dewey. Michigan: very abundant (dominant) on a muskeag near Walsh, Schoolcraft Co., no. 3165.

The previously reported Michigan stations are in Keweenaw Co.

Carex **Garberi**, n. sp. *C. aurea*, var. *androgyna* Olney in Bot. King Exp. 371 (1871), not *C. androgyna* Balb. Elencho, 97 (1801). Type: Presque Isle, Erie Co., Pennsylvania, June 9, 1869, *A. P. Garber*,[1] in herb. Olney (Brown Univ.); isotype in Gray Herb. Plate 360, figs. 1–6.

Carex Garberi is the plant treated in Gray, Man. ed. 7: 232 (1908) as *C. bicolor* All., the plant which, after its first collection on Lake Superior, long stood in North America as *C. bicolor*. Agassiz got it in 1848 on the north shore of Lake Superior and it was then identified by Asa Gray as *C. bicolor* and so recorded by Agassiz.[2] Its relationship is, however, with *C. aurea* Nutt. and *C. Hassei* Bailey, with which it has, very naturally, been confused. With *C. Hassei* (figs 7–9) it shares the whitish papillose and dry perigynia and close spike which separate them both from *C. aurea* (fig. 10), which has the spike loosely few-flowered and the mature perigynia fleshy, smooth, globose-pyriform and golden-orange (drying brownish). Mackenzie has been treating *C. Garberi* (*C. aurea*, var. *androgyna*) as identical with *C. Hassei* of the western United States; but, although they are both distinguished from *C. aurea* by their whitish and papillose mature perigynia and closely-flowered spikes, they differ in several important characters, indicated below.

C. Hassei: inner summit of sheath of foliaceous bracts truncate (fig. 9); spikes mostly remote, the terminal usually staminate throughout; scales of fertile spikes (fig. 7) firm, ovate, mostly acuminate or prolonged into long awns, 2–4 (–6) mm. long; lowest scales of terminal spike (fig. 8) firm, 3.5–5 mm. long, acuminate; principal staminate scales narrowed above to blunt tips, not white-margined.

[1] Abraham Pascal Garber, 1838–1881.
[2] Agassiz, Lake Superior, 166 (1850).

C. Garberi: inner summit of sheath V-shaped (fig. 2); spikes closely crowded and imbricated, the terminal androgynous or wholly pistillate; scales of fertile spikes (fig. 3) membranaceous, broadly oblong or ovate to obovate, mostly rounded at summit (rarely acute) or merely short-mucronate, 1.5–2.5 mm. long; lowest scales (fig. 4) of terminal spike membranaceous, obtuse or merely acute, 2–3.5 mm. long; principal staminate scales broadly rounded at summit, with pale scarious margin.

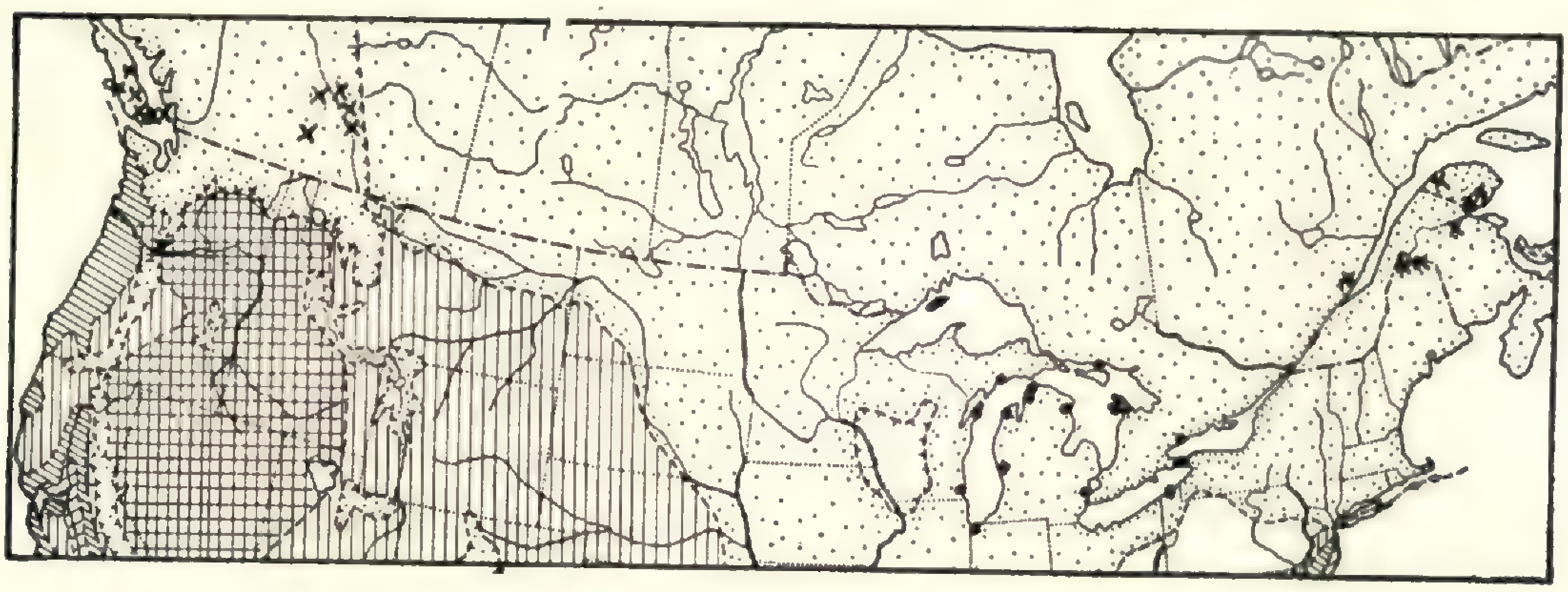
Carex Garberi (fig. 1), abundant on beaches and rocky shores of the Great Lakes from Niagara to the head of Lake Michigan and the north shore of Lake Superior, is stiff, with strict culms 1–3 dm. high, leaves 2.5–5.5 mm. broad; fastigiate and closely approximate spikes 1–3 cm. long; scales almost colorless to medium-brown. The following specimens are in the Gray Herbarium, indicating a general occurrence on shores of the Great Lakes (map 13, dots).

New York: Goat Island, Niagara, June 18, 1865, *Wm. Boott.* Pennsylvania: Presque Isle, Erie Co., June 9, 1869, *A. P. Garber* (type in Olney Herb.—type of *C. aurea*, var. *androgyna;* isotypes in Gray Herb.); damp sand dunes, Presque Isle, *Pease*, no. 12,988. Ontario: shore of Hay Bay, Tobermory, Bruce Co., *P. V. Krotkov*, no. 7144; crevices in limestone, shore of Round Island, Fishing Islands, *Stebbins et al.*, no. 60; limy sand of Sauble Beach, Bruce Co., *Fernald*, no. 3180; peaty depressions in limestone pavement, Great Cloche Island, *Fernald & Pease*, no. 3181; north shore of Lake Superior, 1848, *Agassiz.* Michigan: Isle Royale, *Cooper*, no. 215; calcareous gravel, bordering Bay du Noc, north of Garden, *Fernald & Pease*, no. 3184; calcareous sandy or stony beach of Lake Michigan, east of Manistique, *Fernald & Pease*, no. 8183; wet gravelly shore of Lake Michigan, Mackinaw City, *Gleason & Gleason*, no. 60; sandy banks of creeks, Big Stone Bay, Emmet Co., *Ehlers*, nos. 309, 505; shore of Thunder Bay, Alpena Co., July 15, 1895, *C. F. Wheeler;* Highland Park, Detroit, 1895, *Wheeler*; swale in jack pine plains near Lake Michigan, Glen Haven, Leelanau Co., *F. J. Hermann*, no. 2309; sand dunes near Muskegon, June 28, 1900, *C. F. Wheeler.* Wisconsin: Point of North Bay, Door Co., June 29, 1873, *Schuette;* damp sand, Sand Beach near Rowley's Bay, Door Co., *Pease*, no. 18,007; Racine, June 19, 1881, *J. J. Davis.* Indiana: wet sands, Pine, June 7, 1884, *E. J. Hill*, no. 35; sandy open woods, Pine, *Lansing*, no. 2721.

Typical, strict *Carex Garberi* (fig. 1) of the Great Lakes region has a smaller representative (figs. 11 and 12) in the Northeast and in the Northwest. This plant is weak and flexuous, with leaves narrow, spikes fewer-flowered, short (0.5–2 cm. long) and more spreading on arching peduncles and less approximate, castaneous scales, and perigynia (fig. 12) often with longer stipes and more papillose. It occurs along the rivers and shores from Gaspé Co., Quebec to northern New England and, still farther to the west of the Great Lakes, in the

Canadian Rocky Mountains. On account of this geographic segregation of its areas the plant may be called

C. GARBERI, var. **bifaria**, var. nov. (TAB. 360, FIGS. 11 et 12), a var. typico simillima a qua differt habitu laxiori, culmis gracillimis flexuosis ad 4.5 dm. alto; foliis 1–2.5 mm. latis; spicis vix confertis plus minusve subdistantibus, 0.5–2 cm. longis; squamis castaneis (rare pallidis); perigyniis plerumque longe stipitatis valde papillosis.—Calcareous gravelly, sandy or ledgy shores, Gaspé Co. to Quebec Co., Quebec and the St. John River, New Brunswick and Maine; southern Alberta and southern British Columbia. TYPE: wet limestone ledges by River Ste. Anne des Monts, Quebec, August 3–17, 1905, *Collins & Fernald* in Gray Herb. (MAP 13, *x*'s).



MAP 13. Range of CAREX GARBERI (dots) and of var. BIFARIA (*x*'s).

Most of the specimens have been distributed either as *Carex bicolor* All. or as *C. Hassei* Bailey; a few of them as *C. aurea* Nutt. In mature fruit there is no difficulty in distinguishing *C. Garberi* and its var. *bifaria* from *C. aurea*. When immature they are difficult to tell with certainty. The foliaceous bracts of *C. aurea* are usually more prolonged, the spikes (FIG. 10) less crowded or even remote and more peduncled, the flowers or fruits comparatively few and less densely overlapping, the scales longer and more often acuminate; and when the perigynia have dropped the denuded axis of the spike in *C. aurea* has the scars or joints more remote than in *C. Garberi* (FIG. 5).

C. SCIRPOIDEA Michx., var. CONVOLUTA Kükenthal in Engler, Pflanzenr. iv[20]. 81 (1909). Originally cited only from Thunder Bay Island, Michigan. The following are in the Gray Herbarium, showing a broad range on calcareous shores of Lake Huron. ONTARIO: Little Eagle Harbor, *J. Macoun*, no. 33,729; Bruce Co., 1871, *J. Macoum;* limestone pavement and gravel, Great Cloche Island, no. 3188. MICHIGAN: Drummond's Island, *Winchell;* Point Detour, June 30, 1860, *Wm. Boott;* Thunder Bay Island, July 18, 1895, *C. F. Wheeler*.

This plant of shores of Lake Huron is strongly pronounced in its convolute to almost filiform leaves.

C. concinna R. Br. Ontario: dry arbor vitae woods on limestone pavement, Great Cloche Island, Manitoulin District, no. 3201; Cove Island (off Tobermory), Bruce Co., *Krotkoff*, no. 7183 (Univ. of Toronto). Wisconsin: sandy woods on beach, Ephraim, Door Co., *Pease*, no. 18,016.

The only Ontario station given by Macoun or represented in the National Herbarium at Ottawa is on Lake Nipigon. The Wisconsin station is slightly farther south than the Michigan station (Big Stone Bay) cited by Mrs. Ehlers (Papers Mich. Acad. Sci. iv[1]. 209).

C. Richardsoni R. Br. Ontario: turfy limestone pavement, Cloche Peninsula, no. 3202. Michigan: wind-swept crests, crevices and talus of sandstone-conglomerate, West Bluff, Keweenaw Co., no. 2303.

Already recorded from the Bruce Peninsula and from stations farther east in Ontario; not previously recorded, I think, from the Upper Peninsula of Michigan.

Juncus Vaseyi Engelm. Michigan: dry sandy plain near Driggs, Schoolcraft Co., no. 3223.

Apparently the first record for the Upper Peninsula.

Zigadenus glaucus and Z. elegans (Plate 361).—In the current manuals the plant of the St. Lawrence basin, from Minnesota eastward to the limestones, shales and slates bordering the Gulf of St. Lawrence, is treated as *Zigadenus chloranthus* Richardson or, by those who do not like genera of many species, as *Anticlea chlorantha* (Richardson) Rydb., while *Z. elegans* Pursh or *A. elegans* (Pursh) Rydb. is, correctly, treated as a more western species. The characters used to separate the two plants as given by Rydberg (Fl. Prair. and Plains) are

Petals and sepals white or straw-colored, greenish only on the midrib, not clawed.............................1. *A. elegans.*
Petals and sepals greenish, the former more or less contracted into a broad claw........................2. *A. chlorantha.*

If these were the only differences the two would surely not be specifically separable, especially since the "white or straw-colored" sepals and petals become in Rydberg's fuller statement "dirty-white"; accordingly, with only these differences commonly stated, in the 2nd edition of the Illustrated Flora Dr. Britton united them. Having known the eastern plant both in the field and in the herbarium since I first collected it in 1902, I have noted several characters in addition

Photo. E. C. Ogden.

Ribes Cynosbati: fig. 2, fruiting branch, × 1.
R. Cynosbati, var. atrox: fig. 1, fruiting branch, × 1.

to color of perianth which indicate that there is a western species, *Zigadenus elegans* Pursh (1814) and an eastern one, *Z. glaucus* Nuttall, based nomenclaturally on *Melanthium glaucum* Nutt. Gen. i. 232 (1818), the plant erroneously identified with *Z. chloranthus* Richardson (1821). Nuttall's *Melanthium glaucum* was primarily the plant of the St. Lawrence system.

Hab. On the gravelly banks of the St. Lawrence in calcareous soil; around the Cataract of Niagara, on the borders of Lakes Erie, Huron and Michigan and up the Missouri to Fort Mandan. . . . Flowering in July and August.

All the localities cited, except the Missouri River one, are those of the eastern plant; and the flowering period, "July and August," is that of the plant growing from Lakes Superior and Michigan to the Gulf of St. Lawrence. When, in 1834, Nuttall transferred *Melanthium glaucum* to *Zigadenus*, he had in hand the western paler-flowered *Z. elegans*, as clearly demonstrated by the acute leaves, the color of the flowers and the locality:

107 Zigadenus *glaucus;* Melanthium *glaucum*, Nutt. Gen. Am. 1, p. 232. . . . Leaves . . . acute, and a little shorter than the scape which contains about seven flowers; the flowers white, with greenish claws. . . . *Hab.* Towards the sources of the Missouri . . . the flower is decidedly more white than any other color.—Nutt. Journ. Acad. Phil. vii. 56 (1834).

Even though Nuttall at first confused the plant of the St. Lawrence with the prairie species and later described the latter alone, the original *Melanthium glaucum*, the nomenclatural type, was primarily the eastern plant. Since the western element already had a name, *Zigadenus elegans* Pursh, the name *Z. glaucus* should be retained for the eastern element which Nuttall originally primarily intended. This was the decision of Gray, Man. 499 (1848) and in later editions; and *Z. glaucus* may be considered satisfactorily typified. As to *Z. chloranthus* Richardson, Frankl. Narr. 1st Journ. App. 786 (1821), the description is inconclusive, but it came from a region where *Z. elegans* abounds. At any rate its specific name is antedated by those of both *Z. elegans* and *Z. glaucus*.

Returning to the distinctions between the two species, I summarize them as follows.

Middle and upper bracts of inflorescence herbaceous, tapering to firm subulate tips; sepals and petals strongly suffused on the back with green, bronze or purple; capsule ovoid-conic, 1–1.4 cm. long, 5–8 mm. in diameter, barely exceeding the finally connivent perianth; leaves coriaceous, mostly blunt or subacute; inflorescence a few-forked elongate-lanceolate

to open-ovoid panicle (rarely a simple raceme).—Calcareous gravel, cliffs, shores and bogs, chiefly of the St. Lawrence drainage, Mingan Islands and Anticosti, Quebec, to Minnesota, south to northern New Brunswick, western New York, northern Ohio, northern Indiana and Illinois. Flowering from mid-July to September. *Z. glaucus.*

Middle and upper bracts of inflorescence with scarious margins and summits; sepals and petals paler, with or without a darkened area at base or middle on the outside; capsule lance-conic, 1.3–2.2 cm. long, 4–6 mm. in diameter, twice as long as perianth; leaves thinner, usually sharply pointed; inflorescence a slender loosely cylindric raceme (rarely a panicle).—Prairies, meadows and calcareous rocks, Alaska to Arizona and New Mexico, eastward to Manitoba, Minnesota, Iowa and Missouri. Flowering from early June into July (in Rocky Mts. to August) . . . . *Z. elegans.*

Plate 361 shows characteristic plants of the two species, × 2/5, with details of bracts and fruits, × 2; the habit of *Z. elegans* photographed from a Wyoming specimen (*Payson & Armstrong*, no. 3774), that of *Z. glaucus* from a Michigan plant (*Ehlers*, no. 648).

As to flowering period the following data from the specimens in the Gray Herbarium are pertinent:

Zigadenus elegans

Manitoba: *fr.* July 17
Minnesota: *fl.* June 13–21
Iowa: *fl.* and young *fr.* July 6
Missouri: young *fr.* July 27
North Dakota: *fl.* July 3–7
South Dakota: *fl.* June 9–30
Saskatchewan: *fl.* June 28–July 13
Alberta: *fl.* June 19–August 16 (Rocky Mts.)
Montana: *fl.* June 13–August 11; *fr.* June 13–August 29
Idaho: *fl.* July 11–August 1
Wyoming: *fl.* June 29–August 8; *fr.* August 29
British Columbia: *fl.* June 22–August 10
Yukon: *fl.* June 29–July 18
Alaska: *fr.* July 31

Zigadenus glaucus

Quebec: 1st *buds* unexpanded July 10–August 16; *fl.* July 16–September 9; *fr.* August 15–September.
New Brunswick: *fl.* July 30
New York: *fl.* August 10–15
Ontario: *fl.* July 16–August 22
Michigan: *fl.* July 21–September 27
Ohio: *fl.* July 7 and 8
Wisconsin: *fl.* July 28
Illinois: *fl.* July 24–August 3
Minnesota: *buds* and 1st *fl.* July

Maianthemum canadense Desf., var. interius Fern. Ontario: sandy Jack Pine barrens, Nairn, no. 3234; under *Thuja*, woods on limestone pavement and gravel, Great Cloche Island, no. 3235.

When I described var. *interius*, Rhodora, xvi. 211 (1914), we knew it in Ontario only from north of Lake Superior. In his *Notes on the Range of Maianthemum canadense and its Variety interius*, Rhodora, xxviii. 9–11 (1926), Butters cited no other Ontario stations and concluded that the large, pubescent variety "is distinctly a plant of the deciduous forest . . . it barely encroaches on the northeastern

belt of coniferous forest, and when it does enter this region it is in company with the typical trees and herbs of the deciduous woodlands . . . It appears, therefore, that this essentially western variety, *M. canadense*, var. *interius*, occurs sparingly eastward along the south side of the Great Lakes." It is evident, now, that it follows eastward also along the *north* side of Lake Huron and that it is there in rather boreal surroundings. On the sandy plain near Nairn the plants in the open were mostly sterile but in the shade of *Pinus Banksiana* they were freely flowering and up to 3 dm. high; on Great Cloche Island it was associated with *Carex concinna, C. capillaris, C. scirpoidea* var. *convoluta, Habenaria unalascensis* and other decidedly boreal species in glades among *Thuja occidentalis*, and it there also reached a height of 3 dm.

Cypripedium arietinum R. Br. Ontario: glades among *Thuja*, on limestone pavement, Cloche Peninsula, no. 3247.

Many fruiting plants, with abundant capsules of the preceding year.

Habenaria unalascensis (Spreng.) Wats. Ontario: arbor vitae thickets on the limestone pavement, Great Cloche Island, no. 3251.

Heretofore known between the Rocky Mountains and Anticosti only from somewhere in northern Michigan ("Lake Superior, June, 1860," *Wm. Boott* in Gray Herb.) and the Fishing Islands and adjacent mainland of Bruce Co., Ontario.

Polygonum achoreum Blake, Rhodora, xix. 232 (1917). Blake cited only a single station in Quebec (in Gaspé Co.) and none in Ontario for this northern segregate from *P. erectum* L. It is generally dispersed in open clay soil north to Lake St. John, Temiscaming and the region north of Lake Huron. Our collection is Ontario: clay of roadside near Markstay, Sudbury District, no. 3291.

P. Douglasii Greene. Ontario: about calcareous ledges (with the western *Epilobium paniculatum*) in dry woods, south of Little Current, Manitoulin Island, no. 3292. Michigan: wind-swept crests, crevices and talus of sandstone-conglomerate, West Bluff, Keweenaw Co., no. 3293.

Local east of the Black Hills and the Rocky Mts. Already known from a few stations in Ontario and in Michigan from the islands of Lake Superior.

Cerastium nutans Raf. Ontario: about calcareous ledges in dry woods, south of Little Current, Manitoulin Island, no. 3294.

Macoun cites stations on Lakes Ontario and Erie but none from Lake Huron; but it is represented in the herbarium of the University of Toronto from Go-Home Bay.

Ranunculus fascicularis Muhl. Ontario: peaty pocket in limestone pavement and gravel, Great Cloche Island, no. 3302.

The Ontario stations cited by Macoun are all much further south.

Thalictrum confine Fern. Michigan: glades and openings in thicket bordering calcareous beach of Lake Michigan, east of Manistique, no. 3306.

I find no previous record from the state. For contrast of characters with the western *Thalictrum venulosum* Trel. see Fernald, Mem. Amer. Acad. xv. 279 (1925).

Anemone cylindrica Gray. Michigan: open limestone ledges north of Garden, Delta Co., no. 3308.

Apparently not previously recorded from the Upper Peninsula.

Anemone quinquefolia L., var. **interior**, var. nov., caule superne villoso, villis divergentibus.—Northern Ontario (James Bay) to eastern Manitoba, south to southern Ontario, Ohio, Michigan, Illinois and Iowa. Type: forest, ravine along Pidgeon River, north shore of Lake Superior, Minnesota, July 4, 1924, *Butters & Rosendahl*, no. 4612 (in Gray Herb.).

Familiar with the typical eastern *Anemone quinquefolia*, with the stems glabrous or at most very sparsely appressed-pilose near the involucre, which occurs from eastern Quebec and New Brunswick to North Carolina and across New York locally to Ohio, we were puzzled by the young paler green 1-leaved plants and over-ripe 3-leaved individuals past fruiting, which we found in the dry thickets of northern Michigan. It proves, however, that nearly all material of *A. quinquefolia* from the Great Lakes region north to James Bay has the stems of the flowering plants spreading-villous as are the petioles of the leaves of the 1-leaved young plants and often the petioles of the involucral leaves and the peduncles of the flowers. Var. *interior* is, then, a well defined inland variety, somewhat comparable with *Maianthemum canadense*, var. *interius* Fernald.

I am aware that a Michigan plant, presumably belonging with *Anemone quinquefolia*, var. *interior*, was set off on the basis of its 2-leaved (instead of 3-leaved) involucre as *A. quinquefolia*, var. *bifolia* Farwell, Papers Mich. Acad. Sci. Arts, Let. i. 94 (1923). To take up Farwell's name for the plant with normally 3-leaved involucres which occurs through central-eastern Canada and the Great Lakes states would be quite misleading and unjustified. Var. *bifolia* is an aberration, not a true geographic variety. Individuals with 2 or 4, instead of the usual 3 leaves to the involucre are occasionally found in the more eastern plant with glabrous stems. One collection

(purposely made) from Cambridge, Massachusetts, shows 2, 3 or 4 involucral leaves, and several New England collections show aberrant individuals with 2 or 4 leaves, in all cases collected with the normal 3-leaved type. The selected individuals with 4 leaves have not yet been deemed worthy a latin name; neither have the juvenile plants which have only 1 leaf.

Draba arabisans Michx. Michigan: wind-swept sandstone-conglomerate crest of Lookout Mt., Keweenaw Co., no. 3316. Passing into

D. arabisans, var. canadensis (Brunet) Fern. & Knowlt. Michigan: with the above, no. 3317.

The first station on the mainland of Keweenaw Co., already recorded in Rhodora, xxxvi. 356 (1934).

D. lanceolata Royle (*D. cana* Rydb.). Michigan: crevices and talus of limestone cliff, Burnt Bluff, Delta Co., no. 3318.

The only Michigan station known; recorded in Rhodora, xxxvi. 359 (1934).

Descurainia intermedia (Rydb.) Daniels (*Sophia intermedia* Rydb.). Ontario: limestone pavement and gravel, Great Cloche Island, no. 3322. Michigan: crevices and talus of limestone cliff, Burnt Bluff, Delta Co., no. 3323.

Probably the plant listed by Walpole (Pap. Mich. Acad. vi. 326) as *Sophia pinnata* from the Lower Peninsula of Michigan. Recorded by Macbride (as *Sisymbrium brachycarpon*) in Rhodora, xvii. 140 (1915) from southern Ontario only.

Cardamine parviflora L., var. arenicola (Britton) O. E. Schulz; Fernald, Rhodora, xxix. 192 (1927). Ontario: crevices and talus of hornblendic cliffs and ledges, Cloche Peninsula, no. 3328.

North of previously cited Ontario stations, this is the first locality in the Province represented in the Gray Herbarium. Owing to the past confusion of species in the genus it is probable that the old records need careful scrutiny.

Heuchera Richardsonii R. Br., var. Grayana Rosend., Butt. & Lak. Rhodora, xxxv. 117 (1933). Michigan: sand plain south of Iron Mountain, Dickinson Co., no. 3355.

The range given by Rosendahl, Butters & Lakela, "from Kansas to Indiana and northward to central Wisconsin and southeastern Minnesota" does not include the Upper Peninsula of Michigan.

Ribes Cynosbati L., var. **atrox** (tab. 362, fig. 1), var. nov., ramibus fructiferis crassis ramulisque densissime retrorso setosis; baccis setosissimis.—Ontario: about calcareous ledges in dry woods,

south of Little Current, Manitoulin Island, June 29, 1934, *Fernald & Pease*, no. 3358.

It would be difficult to find a more fiercely armed Gooseberry than that of Manitoulin Island. Typical *Ribes Cynosbati* (fig. 2) has the slender fruiting branches smooth or merely with 1–3 nodal prickles, the berries more or less prickly but not so extremely armed as in var. *atrox*. In the material at the Gray Herbarium of *R. Cynosbati* I find none with the stout and stiff branches nor with anything approaching the bristliness of var. *atrox*. In the Canadian National Herbarium there is a mild approach to it in a specimen from Wingham, Ontario, *J. A. Morton*, no. 749.

Amelanchier huronensis Wiegand, Rhodora, xxii. 150 (1920). Ontario: crevices and talus of hornblendic cliffs and ledges, Cloche Peninsula, no. 3364. Michigan: trees 3–4 m. high at border of woods along Lake Superior, Bête Grise, Keweenaw Co., no. 3361.

Not recorded by Wiegand, though to have been expected, from the Lake Huron region of Ontario.

A. intermedia Spach. See Wiegand, l. c. 147 (1920). Michigan: trees 6 m. high at border of woods along Lake Superior, Bête Grise, Keweenaw Co., no. 3362.

When he revived Spach's species Wiegand had seen it in the Alleghenian region from Vermont to western New York, south to North Carolina. Subsequently, Rhodora, xxiii, 103, I extended its range eastward to Nova Scotia and Prince Edward Island. The tree at Bête Grise is very abundant and characteristic.

(*To be continued*)

A New Species and Two New Varieties of Glyceria.—During a study of specimens of *Glyceria* from Asia, the following species and varieties were found to be apparently undescribed.

Glyceria **kashmiriensis**, nov. sp., *G. nemorali* similis sed culmi erecti; laminis angustioribus 2–4 mm. latis; lemmatibus 9-nerviis.

Culmi 40–50 cm. alti laeves; vaginis laevibus, nervis transversis non prominentibus; laminis 10–15 cm. longis, 2–4 mm. latis, supra subtusque laevibus; paniculis 10–15 cm. longis angustis erectis, ramis tenuibus erectis, 5 cm. longis; spiculis 5–8 mm. longis, 2 mm. latis, 4–7-floribus; glumis ovatis, hyalinis, prima 1 mm. longa, 1-nervia, secunda 1.5 mm. longa, 3-nervia; lemmatibus 2–2.8 mm. longis, obtusis vel acutiusculis distincte 9-nerviis, viridibus; carinis paleae puberulentibus.—Kashmir: Liddar Valley above Palgam, 8,000–9,000 ft., September 17, 1893. *J. F. Duthie* 13,092 (type, No. 948,543, in U. S. Nat. Herb.).

Similar to *G. nemoralis* but culms erect; blades narrower, 2–4 mm. wide; lemmas 9-nerved, whereas *G. nemoralis* Uechtritz and Koernicke has decumbent culms, wider blades, and 7-nerved lemmas.

Culms 40–50 cm. high, smooth; sheaths smooth, cross-nerves not prominent; blades 10–15 cm. long, 2–4 mm. wide, smooth on both surfaces; panicles 10–15 cm. long, narrow, erect, the branches slender, erect, 5 cm. long; spikelets 5–8 mm. long, 2 mm. wide, 4–7 flowered; glumes ovate, hyaline, first 1 mm. long, 1-nerved, second 1.5 mm. long, 3-nerved; lemmas 2–2.8 mm. long, obtuse or acutish, distinctly 9-nerved, green; keels of the palet puberulent.

This species is known only from the type locality.

GLYCERIA TONGLENSIS C. B. Clarke, var. **honshuana**, nov. var., *G. tonglensi* typicae similis sed ramis paniculorum nunquam reflexis; lemmatibus minus scabris, nerviis glabris.—JAPAN: Honshu, Lake Nikko to Chuzenji, alt. 2,000–4,000 ft., July 24, 1921. *A. S. Hitchcock* 18,341 (TYPE, No. 1,106,457, in U. S. Nat. Herb.).

Similar to *G. tonglensis* but branches of the panicles never reflexed; lemmas more nearly glabrous, the nerves glabrous. *G. tonglensis* has the branches of the panicle reflexed at maturity; the lemmas and their nerves very strongly scabrous.

To this variety may be referred all Japanese specimens of *G. tonglensis* in the National Herbarium. Its range is the greater part of Japan. Typical *G. tonglensis* is found in the Himalaya Mountains of nothern India and southern China.

GLYCERIA STRIATA (Lam.) Hitchc., var. **mexicana**, *G. striatae* var. *strictae* (Scribn.) Fernald similis sed lemmatibus 2.2–2.8 mm. longis, acutiusculis.—Mexico: El Chico, State of Mexico, August, 1928. *P. Lyonnet* 267 (TYPE, No. 1,034,156, in U. S. Nat. Herb.).

Similar to *G. striata* var. *stricta* but lemmas longer, 2.2–2.8 mm. long and acutish, whereas in var. *stricta* the lemmas are 2–2.2 mm. long and obtusish.—LEON KELSO, Washington, D. C.

ASTER PATENS Ait., forma **rosea** f. nova, ligulis roseis.

Among the numerous patches of *A. patens* seen on the open downs at Montauk were two clumps characterized by rays of a light lavender-pink instead of the usual deep bluish purple color (*Svenson* no. 4727, Oct. 11, 1931, TYPE in herb. Brooklyn Botanic Garden). Fragments of the original plant are growing luxuriantly at the Brooklyn Botanic Garden and continue to show the handsome pink coloration of the rays. Seedling plants, as might be expected, have the typical blue color.—H. K. SVENSON, Brooklyn Botanic Garden.

NOTES ON LESPEDEZA

Milton Hopkins

Several weeks ago Mr. C. C. Deam sent to the Gray Herbarium for determination a set of specimens of *Lespedeza* from Indiana, and pointed out the fact that several sheets of *L. virginica* (L.) Britton possessed a spreading type of pubescence instead of the usual strigose type. In examining these sheets I was impressed by the similarity which they bore to *L. Stuevei* Nutt. var. *angustifolia* Britton, but under close scrutiny several differences appeared. Consequently, it became necessary to study all the material of the close relatives of *L. virginica* in the Gray Herbarium in order satisfactorily to place these specimens.

The current treatment of the genus in our Manuals is necessarily brief and concise, and in many instances this brevity makes accurate identification so difficult that it was felt that a short synopsis of each of the species closely related to *L. virginica* would be exceedingly helpful. The following brief descriptions do not contain any wholly new characters, but they include various ones which have been used in some Manuals and omitted in others.

L. Stuevei: stem erect, virgate or more rarely virgate-branched, densely pubescent with wide-spreading hairs; principal cauline leaflets small for the group, elliptic-oblong to oval or more rarely suborbicular, appearing crowded on the stem, densely strigose-tomentose beneath, slightly less so above; petioles subappressed, shorter than the leaves, averaging 1.7 cm. in length; flower-clusters appearing crowded and sessile to subsessile; peduncles of the petaliferous flowers short, 3–10 mm. in length; calyx and pod commonly villous-canescent.

L. virginica: stem erect, virgate or more rarely virgate-branched, sparingly pubescent with short, closely appressed hairs; principal cauline leaflets linear to linear-oblong, appearing crowded on the stem, strigillose to glabrous above, strigose beneath; petioles subappressed, slightly shorter than the leaves, averaging 2 cm. in length; flower-clusters appearing crowded and sessile or subsessile; peduncles of petaliferous flowers short, 3–12 cm. in length; calyx and pod commonly strigose to strigillose.

L. intermedia: stem erect, virgate-branched, more rarely strictly virgate, sparingly pubescent with closely appressed short hairs; principal cauline leaflets larger than in *L. Stuevei* and *L. virginica*, elliptic-oblong to oval or rarely suborbicular, appearing less crowded on the stem than in the preceding two species, glabrous or very rarely strigillose above, strigose beneath; petioles more spreading than in the above two species, nearly equalling but rarely exceeding the length of the leaves; flower-clusters less crowded, but appearing sessile or subsessile; peduncles of the petaliferous flowers mostly longer than in the preceding two species, averaging 11 mm. in length; calyx and pod commonly strigose to strigillose.

It appears that *L. Nuttallii* Darlington, with its very striking, long peduncles, and the villous pubescence of its stem, is rather clearly distinct from the members of this group, and although its close relationship is readily admitted, it may be safely excluded from a discussion of this nature.

Some varieties of *L. intermedia* and *L. Stuevei* have already been recognized, but in view of the fact that these do not exhibit any peculiar geographic segregations and are to be found throughout the range of their species, and in view of the fact that they differ from the typical form of the species in either the type of the pubescence of the stem or in the shape of the leaflets, it seems wiser to reduce them to mere forms than to maintain them as varieties, and to describe the Indiana plant, likewise, as a form. This may be done as follows:

L. VIRGINICA (L.) Britton f. **Deamii**, n. f., caulis pubescens pilis patentibus.—Sandy hillsides and dry fields and barrens, Connecticut west to Illinois and south to Tennessee. CONNECTICUT: New Haven, without number and without date, *ex Herb. A. Gray.* NORTH CAROLINA: dry hillsides, Swain County, altitude 2000 ft., *Beardslee* and *Kofoid*, 1891. KENTUCKY: barrens of Ky., 2–3 ft. high, *C. W. Short*, 1835. TENNESSEE: Hollow Rock Jc., Carroll County, *H. K. Svenson*, August 27, 1922, No. 456. INDIANA: 4 miles north of Washington, Davies County, Sept. 19th, 1934, *C. C. Deam*, No. 55,645 (TYPE in the Gray Herbarium); 6 miles n. w. of Chesterton, Porter County, 14 Sept. 1934, *C. C. Deam*, No. 55,556. ILLINOIS: Bath, black-jack oak association, Aug. 17, 1903, *H. A. Gleason.*

L. INTERMEDIA f. **Hahnii** (Blake), n. comb. *L. intermedia* var. *Hahnii* Blake in RHODORA xxvi. 29 (1924).

Typical *L. intermedia* possesses an appressed pubescence on the stem, whereas this form has a spreading pubescence on its stem.

L. STUEVEI f. **angustifolia** (Britton), n. comb. *L. Stuevei* var. *angustifolia* Britton in Trans. N. Y. Acad. Sci. xii. 63 (1893); Blake in RHODORA xxvi. 29 (1924). *L. Stuevei neglecta* Britton in Mem. Torr. Bot. Club v. 206 (1894). *L. neglecta* Mackenzie and Bush in Trans. Acad. St. Louis xii. 17 (1902).

The only difference between this plant and the typical form of the species is in the shape of the leaflets, those of the former being linear or linear-oblong, while those of the latter are elliptic to oval.

The various differences between the three species and their forms is brought out in the descriptive key below:

a. Leaflets linear to linear-oblong....*b.*
  b. Pubescence of stem appressed.......................... *L. virginica.*
  b. Pubescence of stem wide-spreading or ascending....*c.*
    c. Upper surface of leaflets glabrous to strigillose with short hairs, lower surface merely appressed-pubescent; peti-

oles of principal cauline leaves averaging 2.2 cm. in length; calyx and pod commonly strigillose to strigose. .... *L. virginica* f. *Deamii.*

c. Upper surface of leaflets tomentose-strigose with long hairs, lower surface more densely so; petioles of principal cauline leaves averaging 1.7 cm. in length; calyx and pod commonly villous-canescent.... *L. Stuevei* f. *angustifolia.*

a. Leaflets oval to elliptic-oblong, rarely suborbicular....*d.*

d. Pubescence of stem appressed........................ *L. intermedia.*

d. Pubescence of stem wide-spreading or ascending....*e.*

e. Upper surface of leaflets glabrous or sparingly strigillose, lower surface strigose; petioles of principal cauline leaves nearly equalling the length of the leaves, rarely exceeding them; peduncles of petaliferous flowers averaging 11 mm. in length; calyx and pod commonly strigose to strigillose.................... *L. intermedia* f. *Hahnii.*

e. Upper surface of leaflets tomentose-strigose, lower surface more densely so; petioles of principal cauline leaves shorter than the leaves; peduncles of petaliferous flowers short, averaging 6 mm. in length; calyx and pod commonly villous-canescent........................ *L. Stuevei.*

Gray Herbarium.

Festuca sciurea in New Jersey.—While range extensions are still of frequent occurrence even in the eastern States where the flora may be considered to be comparatively well known, yet when an unreported species appears in a region which has been as carefully botanized as the Philadelphia area it seems particularly worthy of note. Few areas have received as much attention from the early American botanists, and the detailed exploration of the territory in recent times by members of the Philadelphia Botanical Club and particularly the meticulous and indefatigable work of Mr. Bayard Long in this region have made its flora one of the most intimately known in the country. But that the flora of any area is not likely to be completely known was illustrated by the discovery of a well-established colony of *Festuca sciurea* Nutt., previously unrepresented from New Jersey, near Mantua, Gloucester Co., on May 7, 1933.

In a dry sandy field and in open oak-sassafras barrens 3/5 mile south of Mantua this native southern species was growing plentifully with the closely related *F. octoflora* L. Its resemblence to the latter species was very marked especially since all of the plants were dwarfs, most of them only 6–10 cm. high and the largest not over 20 cm. The very long awns, however, as well as the remarkably short leaves which were chiefly clustered at the bases of the culms so as almost to form rosettes, at once marked it as distinct, and the first glumes being distinctly more than one half the length of the second showed

that it could not be a depauperate form of *F. myuros* L. The identification was subsequently confirmed by Professor Hitchcock who writes that the species was previously known as far north as Maryland and that collections of it from that State are likewise chiefly dwarfs. Specimens from the New Jersey locality (*F. J. Hermann* nos. 4084, 4137, 4139 and 4434) have been deposited in the U. S. National Herbarium, the Gray Herbarium, the Herbarium of the Philadelphia Academy of Natural Sciences and of the Missouri Botanical Garden.—F. J. Hermann, University of Michigan.

Panicum longifolium in New Hampshire.—On the south shore of the Long Bay[1] of Lake Ossipee in Effingham, New Hampshire, on 10 August, 1934, I collected specimens of a *Panicum* which I at the time mistook for *P. agrostoides* Spreng. As pointed out to me later, however, by Mr. C. A. Weatherby, they really belong to *P. longifolium* Torr., and represent an extension of range from Plymouth and Bristol Counties, Massachusetts and southern Rhode Island and Connecticut. In view of the occurrence of certain other coastal plain species on the margins of sandy ponds in Carroll County, New Hampshire, such as *Eleocharis tuberculosa* (Michx.) R. & S. at White Pond, Tamworth (see Rhodora, **26** (1924), 37–38), *Hudsonia ericoides* L. at Lake Ossipee in Freedom and Ossipee, and *Solidago tenuifolia* Pursh, var. *pycnocephala* Fernald, abundant at several ponds in Ossipee and Madison, New Hampshire and in Lovell, Fryeburg, Brownfield, Harrison, and Limington, Maine, the range of *Panicum longifolium* suggests the need of more intensive study of such localities in this region, which has been somewhat neglected by recent collectors.—Arthur Stanley Pease, Cambridge, Massachusetts.

An Improvement in the Method of Preparing Certain Gymnosperms for the Herbarium.—Difficulty usually attends the preparation of exsiccati of the genera *Picea*, *Tsuga* and *Abies*, in that they lose most, if not all, their leaves in the procedure. Boiling fresh specimens has been tried without materially increasing the number of leaves reatined.

For three years the Botanical Laboratory of The University of

[1] Called Leavitt Bay on the U. S. G. S. topographic map.

Tennessee has been using the method here described with more than usual success.

The method is as follows: a fresh specimen, cut to fit the herbarium sheet, is put on a glass plate covered with unthinned herbarium glue or paste. After all portions have been carefully pressed against the glue, it is placed on the herbarium sheet and the larger twigs fastened down with gummed tape. Two layers of medium weight cheese cloth are placed over the specimen. It is then inserted between several blotters and pressed under approximately 100 lbs. weight. After 2 or 3 weeks, during which time the blotters may be changed, the cheese cloth may be carefully removed, and the sheet is ready for the herbarium.

Although some leaves are lost in preparation by this method, the number retained averages 60 per cent or more, a much larger percentage than was retained in any procedure previously employed.—A. J. Sharp, The University of Tennessee.

Dwarf Mistletoe on White Pine.—I am unable to find any reference to the occurrence of the dwarf mistletoe (*Arceuthobium pusillum* Peck) upon white pine (*Pinus Strobus* L.) and for that reason it seems desirable to record the collection of it upon what appears to be a new coniferous host-species. The collection was made at Hotel Champlain, Clinton county, New York, by Mr. G. V. Schwartz of the Forestry Department of the Delaware & Hudson Railroad, in November, 1934, and the material, preserved in formalin, communicated to the New York State Museum by Mr. E. W. Littlefield of the New York State Conservation Commission. Data accompanying the collection indicates that it occurred associated with infestation on white spruce (*Picea canadensis* (Mill.) BSP.)—H. D. House, New York State Museum, Albany.

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Photo. H. G. Fernald.

RUBUS PARVIFLORUS, × 1/10, ON KEWEENAW PENINSULA.

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FURTHER NOTES ON PAST PERIODS OF EELGRASS SCARCITY

Clarence Cottam

Since my paper on Past Periods of Eelgrass Scarcity was published in Rhodora (Vol. **33**, pp. 261–264), July, 1934, a few more records have been obtained. A factor of wide distribution appears to have been responsible for some of these records while peculiar local conditions seem adequate to account for other periods of local subnormal production. All evidence still indicates that probably no period of eelgrass scarcity in the history of our country can be compared in intensity, duration, or completeness with the present catastrophe. Additional evidence further indicates that the 1893–94 period was one of general scarcity of the plant along the Atlantic coast of North America. Furthermore, the conditions at that time seem to have been more unfavorable than those of any other period except the present one, which became so widespread and complete in 1931–32 and has continued to the present.

In Rod and Gun in Canada, February, 1934 (Vol. **35**, No. 9, p. 20) C. I. McNab, writing of early conditions of marine wild fowl, says, "Regarding the disappearance of eelgrass, I remember about forty years ago [1893–94] the eelgrass disappeared in a similar manner [as it has done since 1931], but I cannot recall what effect it had on game and rifle. It took five or six years to get back to normal again and I believe that within the two years we shall have a good supply." This confirms records given in the summary above referred to and it also coincides with numerous verbal reports of many of the older coastal fishermen and sportsmen with whom I have recently conversed.

In a letter of January 25, 1935, Dr. Robert Lami, Assistant in the Laboratoire de Cryptogamie, Paris, France, gives further support to

our data that the period 1893–94 was one of wide destruction of eelgrass. He states that in France it seems likely that an important period of eelgrass diminution occurred 40 years ago; however, he assures us that it was less complete than the present one and not so extensive. He further reports that in a large bay in Portugal where a part of the people earn their living from the gathering and marketing of eelgrass there has never in the memory of man been a period of scarcity.

New evidence suggests the possibility that abnormal local conditions may have been responsible for the local diminution of *Zostera*. Among these factors may have been extreme cold, which may have caused the ice to cut the green leaves of the plant and so retard growth in certain shallow areas; or severe storms, which may have covered shoals with sand or cut new inlets, thereby abruptly increasing the salinity in an area where the particular flora was adapted to quite different conditions.

Lord Ilchester, in "Swans and Grass Wrack," The Field (London), October 21, 1933, 162 (4217): 1037, gives examples of diminution of the plant in the British Isles resulting from extreme cold weather. In refuting an earlier article that appeared in the same magazine attributing a previous scarcity of *Zostera* to the disease that is now believed to be responsible for the present malady, he states that in the winter of 1878–1879 and also 1880–1881 extreme and unprecedented cold caused widespread destruction of the plant along the shallow coastal section of Great Britain and that he did not believe this was traceable to any other factor.

While doing recent field work along our Atlantic coast from southern North Carolina to the Bay of Fundy between the eastern extremity of Maine and Nova Scotia, I received numerous but often vague and indefinite reports of past periods wherein there was a scarcity, or at least a subnormal crop, of eelgrass. One of these reports was of more than ordinary interest. R. C. Walker, who formerly lived at Ocean City, Md., told of an abrupt decrease of the plant in Isle of Wight and Assawoman Bays in 1921 following a very severe storm, which made new inlets connecting the bays with the ocean. He stated that the plant was more than two years in recovering. It seems probable that the abrupt increase of salinity, and perhaps also shifting ocean sands, rather than disease may have destroyed or retarded the growth of plants accustomed to more dilute concentrations of sea water. Mr. Butcher in writing in the Journal du Conseil (Vol. **9**, No. 1, April,

1934, Conseil Permanent International pour l'Exploration de la Mer; Zostera, Report on the present condition of Eelgrass on the coast of England, pp. 49–65) states that two definite periods of decrease in *Zostera* can be distinguished. One of them was immediately after the war (about 1920) and the other in 1931–32 when the plant so nearly disappeared from the American Atlantic coast. The first period of diminution was gradual and therefore not widely noticed while the second was abrupt and more widespread and therefore more conspicuous.

In the abstracts of the proceedings of the Linnean Society of New York for 1931 and 1932, published November 15, 1934 (pp. 40–43), Charles A. Urner, in writing of the eelgrass blight of the New Jersey coast, states that in Barnegat Bay he noticed "as early as 1929 that the drift was reducing in volume and that the dense beds of floating eelgrass in the cover, attractive as a feeding ground to many shorebirds, were becoming less extensive each summer." He stated, however, that the greatest damage to the eelgrass occurred in 1931 and 1932.

From recent observations along the coast it is apparent that in most sections conditions are still very unsatisfactory. Areas of reduced salinity in most places are making the best return. Improvement also is more noticeable in the southern half of the eelgrass range than it is farther north.

Chesapeake Bay shows an encouraging change, with a few localized areas fast approaching the normal. A progressive improvement for more than a year also has been noted in Shinnecock and Mecox Bays, Long Island, N. Y., while a less noticeable improvement is found in Pamlico Sound and Swanquarter Bay, North Carolina. Most of the more open coastal bays from Virginia northward showed little improvement during the past year. In a few areas conditions are worse than they were a year ago, while many others show little or no change. Considering the coastal area as a whole some improvement is noticeable, with the best progress in areas of reduced salinity and in more southern latitudes. Reports from several countries of Europe indicate that eelgrass conditions are still very bad there, yet perhaps slightly improved over those noted a year ago. The causative factor or factors for this unprecedented catastrophe are not positively known, though the evidence seems to point to a fungoid disease, possibly a Mycetozoan.

U. S. Biological Survey,
Washington, D. C.

CRITICAL PLANTS OF THE UPPER GREAT LAKES REGION OF ONTARIO AND MICHIGAN

M. L. Fernald

(*Continued from page 262*)

Crataegus Douglasii Lindl. Ontario: shore of Lake Superior, Agawa Bay, Algoma Distr., *Pease*, no. 18,050. Michigan: wind-swept sandstone-conglomerate crest of Lookout Mt., Keweenaw Co., no. 3374.

Already known from northern Michigan, from Michipicoten Island, Lake Superior (Thunder Bay Distr., Ontario) and from Abitibi River (between outlet of Lake Abitibi and mouth of Black River—Nat. Herb., Ottawa) in Cochrane District. Otherwise known as a typical shrub or small tree of the Pacific slope (California to southern British Columbia) eastward across Idaho to western Montana and Wyoming.

Map 14. Range (generalized) of Rubus parviflorus, including all Varieties.

Rubus parviflorus and its Varieties (Plates 363–365).—The beautiful white-flowered *Rubus parviflorus* Nutt. (Plate 363), the "Thimbleberry" of the Upper Great Lakes region, is there isolated from the Black Hills and the Rocky Mountains, whence it extends to the Pacific, where it is better known as "Salmon Berry." Realizing the improbability that a species of *Rubus* would remain constant or unvarying over the vast and diverse area (map 14) from the coast of southern Alaska to southern California and throughout much of the cordilleran region southward into Mexico and isolated about the Upper Great Lakes, I have felt it important to study with care the large accumulation of material in the Gray Herbarium; and as the study progressed I have borrowed the material from the two Great Lakes states most concerned, Michigan and Wisconsin, and here express my appreciation to Professors Ehlers, Darlington and Fassett for the use of the extensive collections in their charge, which have proved indispensable in working out the variations which reach "the Manual range." It would have been advantageous to see more extensive collections from the Rocky Mountain area and the Pacific slope but the immediate problem chiefly concerned the shrub of Ontario, Michigan, Wisconsin and Minnesota; and the treatment here proposed may readily be adapted to the more continuous western region.

Focke, treating the species as *Rubus nutkanus* Moçino (1825) instead of *R. parviflorus* Nutt. (1818), recognized three varieties but, even with these removed, he described the inflorescence with "setae glanduliferae nunc flexilis, longae, glutinosa, nunc brevissimae, ita ut glandulae subsessiles evadant."[1] And Rydberg, although separating *R. parviflorus* and *R. odoratus* L. as a genus *Rubacer* Rydb. (1903), set off from *R. parviflorus* only one of its eight components and that as a species, *Rubacer tomentosum* Rydb., a renaming of *Rubus velutinus* Hook. & Arn. (1832), not Vest (1823). For the remaining highly variable elements of *Rubus parviflorus* Rydberg described the "inflorescence more or less glandular hispid and often more or less puberulent,"[2] overlooking the significant fact that the "more . . . glandular" inflorescences do not occur in the Rocky Mountains, while the "less glandular" ones (to the extent of complete loss of glands) are restricted to the Rocky Mountain region and are absent from the Pacific coastal region and from the Great Lakes area.

In fact, a study of the indument of pedicels, calyx and leaf-surfaces

[1] Focke, Biblioth. Bot. lxxii. 124 (1911).
[2] Rydb. N. Am. Fl. xxii. 426 (1913).

shows that *Rubus parviflorus* consists of at least eight more or less localized trends, quite comparable with the geographic varieties of *R. idaeus*,[1] which Rydberg, in the North American Flora, maintains as twelve species separated on parallel differences in the indument. It is, furthermore, a disconcerting but indisputable fact that these very differences in the distribution of glands in the inflorescence and of pilosity on the calices, branches and leaves or the absence of glands and pilosity from these areas, which mark the eight geographic segregates of *Rubus parviflorus*, are precisely the characters which are shuffled and reshuffled to add to the ever increasing score of "species" of Blackberry (*Rubus* § *Eubatus*)! In *R. parviflorus* not even our most ardent advocates of specific segregation, who have felt competent to make generic segregates, have noticed them; nevertheless, they are quite as conspicuous in *R. parviflorus* as in segregates of *Rubus* § *Eubatus*, and if their phylogenetic importance is of equal value in the two sections, the Blackberries are eventually due for a pretty drastic realignment.

The greatest extremes in the series of intergrading varieties of *Rubus parviflorus* are var. *velutinus* (Hook. & Arn.) Greene (PLATE 364, FIGS. 3 and 4) and var. *scopulorum* (Greene) (PLATE 364, FIG. 5). The former has the leaves pilose on both surfaces, very densely so and somewhat whitened beneath; the branchlets and pedicels long-pilose or villous among the elongate, dark glands; the calyx densely villous on the outside, the villi overtopping and mostly hiding the glands. This extreme is confined to the Pacific Slope, mostly of California; but also on the Pacific slope we find other variations connecting gradually with series with glabrous leaves, pedicels glabrous or short-pilose and with very short glands, and calyx glandular or glandless and not villous. East of the range of var. *velutinus* there occurs var. *scopulorum*, with leaves quite glabrous beneath, the pedicels quite glandless or with minute and scattered sessile glands; and in the southern Rocky Mountains var. *scopulorum* gives way to a dwarf extreme, var. *parvifolius* (Gray) (PLATE 365, FIGS. 1–3) in which the leaves are mostly glabrous and the pedicels decidedly so. Contrasted with the reduction or loss of glands in some Rocky Mountain extremes (though a wide-ranging variety with short stipitate glands (PLATE 365, FIG. 4) also occurs there) we have the great development of long stipitate glands (PLATE 364, FIG. 6 and 365, FIG. 4) on much of

[1] For revision of *Rubus idaeus* and some of its varieties see Fernald, Rhodora, xxi. 89–98 (1919).

the material of the Pacific Slope and about the Upper Great Lakes. These varieties need not here be discussed but it becomes necessary to determine the exact significance of the two original specific names, *R. parviflorus* Nutt. Gen. i. 308 (1818) and *R. nutkanus* Moçino ex Seringe in DC. Prodr. ii. 588 (1825).

Singularly enough, true *Rubus parviflorus* (var. *genuinus*) is the rarest and most highly localized of the varieties. In view of the prevalence about the Upper Great Lakes of variations with glandular-hispid calices, it is surprising that Thomas Nuttall originally got hold of a very rare extreme, with the calyx densely white-villous, as in the Californian var. *velutinus*. Nuttall, who chose a most unhappy name for one of the largest-flowered species of the genus, gave this account.

* *parviflorus*. Shrubby and unarmed, leaves simple, palmately lobed; peduncles 2 or 3-flowered; flowers small; segments of the calix villous, ovate, abruptly acuminate; petals oblong-ovate, white. Hab. On the island of Michilimackinak, lake Huron.—Nutt. Gen. i. 308 (1818).

Just such a shrub, with the calyx densely white-villous (PLATE 364, FIGS. 3 and 4), is represented before me by a specimen collected on Mackinac Island in July, 1881 by T. E. Boyce. I have seen no other material like it from Mackinac Island; but it is in the herbarium of the Michigan State College from a single area (Gogebic Co.) on the Upper Peninsula of Michigan and in that of the University of Wisconsin from three counties in northern Wisconsin. The identity of *R. parviflorus* (var. *genuinus*) is, therefore, clear. Its nearest relative, it is noteworthy, is the Californian var. *velutinus*, rather than the other varieties which occur about the Upper Great Lakes.

The identity of *Rubus nutkanus* is not easily made out from the description. Seringe, taking the name from a manuscript of Moçino, graciously ascribed it to the Spanish botanist; but Seringe's description needs special interpretation. It was as follows:

92. R. NUTKANUS (Moç. pl. Nutk. icon.) caule fruticoso inermè glutinoso, ramis teretibus glabris rufis, foliis 5-lobis inaequaliter dentatis floribus subcorymbosis subquanternis, laciniis calycinis ovatis glabris longè acuminatis corallam aequantibus . . . in Americâ boreali. Aff. R. odorato sed pedunculi calycesque glabri. Fl. albi. Fruct. ign.

Nootka (or Nutka) Sound is on the west side of Vancouver Island. No form of *Rubus parviflorus* known in the region from Sitka to California has *glabrous* peduncles, all of them being copiously glandular. Consequently, in interpreting the description it is necessary to take into account the romantic and not-too-well-known history of the plates (*icones*) of Moçino and Sessé. Very briefly, these drawings

(not botanical specimens), brought by a Spanish student to Geneva and then peremptorily ordered returned to Madrid, were hastily copied by artistically inclined ladies for their friend, A. P. De Candolle; and the many descriptions from the drawings of Moçino and Sessé were actually made, not from the original specimens or even the original drawings, but from the hastily made copies. A tracing of the copy of *R. nutkanus* at Geneva is in the Gray Herbarium. Although not exactly identifiable as to variety, it is certainly *R. parviflorus*. I am accordingly recognizing the plant (plate 365, fig. 4) of the Pacific slope with least obvious pubescence as standing for *R. nutkanus*. In 1929, Farwell, without designating any of the characters used in this paper, substituted for *R. nutkanus* the name *R. parviflorus*, var. *grandiflorus*.

As I view *Rubus parviflorus* it falls into the following geographic varieties. In citing specimens those not in the Gray Herbarium are indicated as follows: University of Michigan (Mich.); Michigan State College (Mich. State); University of Wisconsin (Wisc.); Arnold Arboretum (Arn. Arb.).

a. Glands of the pedicels all or nearly all stipitate. . . .*b*.
  b. Calyx-lobes densely long-villous with pale trichomes hiding the glands; leaves mostly soft-pubescent to touch beneath; glands of pedicels long and unequal.
    Petioles and young branches sparsely short-pilose to glabrous except for the stipitate glands; leaf-blades glabrous or glabrate above, green beneath . . . . 1. Var. *genuinus*.
    Petioles and young branches copiously long-pilose to villous among the glands; leaf-blades soft-pubescent to touch above, the young whitish-velutinous beneath . . . . 2. Var. *velutinus*.
  b. Calyx-lobes puberulent, minutely tomentulose or glandular-hispid, not long-villous. . . .*c*.
    c. Glands of pedicels and peduncles very unequal, mostly dark-colored, the longest often 1–2 mm. long.
      Lower surfaces of leaves with soft divergent pubescence (soft to touch) abundant . . . . 3. Var. *hypomalacus*.
      Lower surfaces glabrate to glabrous, not obviously soft-pubescent to touch . . . . 4. Var. *heteradenius*.
    c. Glands of pedicels and peduncles mostly subequal and short, often pale, rarely more than 0.5 mm. long, longer scattered glands when present rarely more than 1 mm. long.
      Lower surfaces of leaves with soft divergent pubescence (soft to touch) abundant . . . . 5. Var. *bifarius*.
      Lower surfaces of leaves glabrous or soon glabrate. 6. Var. *grandiflorus*.
a. Glands of pedicels all or nearly all sessile or subsessile or even wanting; leaves glabrous or only minutely and sparsely pubescent beneath.
  Shrubs mostly 1–2 m. high; leaves mostly 1–3 dm. broad, glabrous beneath; inflorescences 3–7-flowered, their lowest pedicels 1–3.5 cm. long. . . . . 7. Var. *scopulorum*.

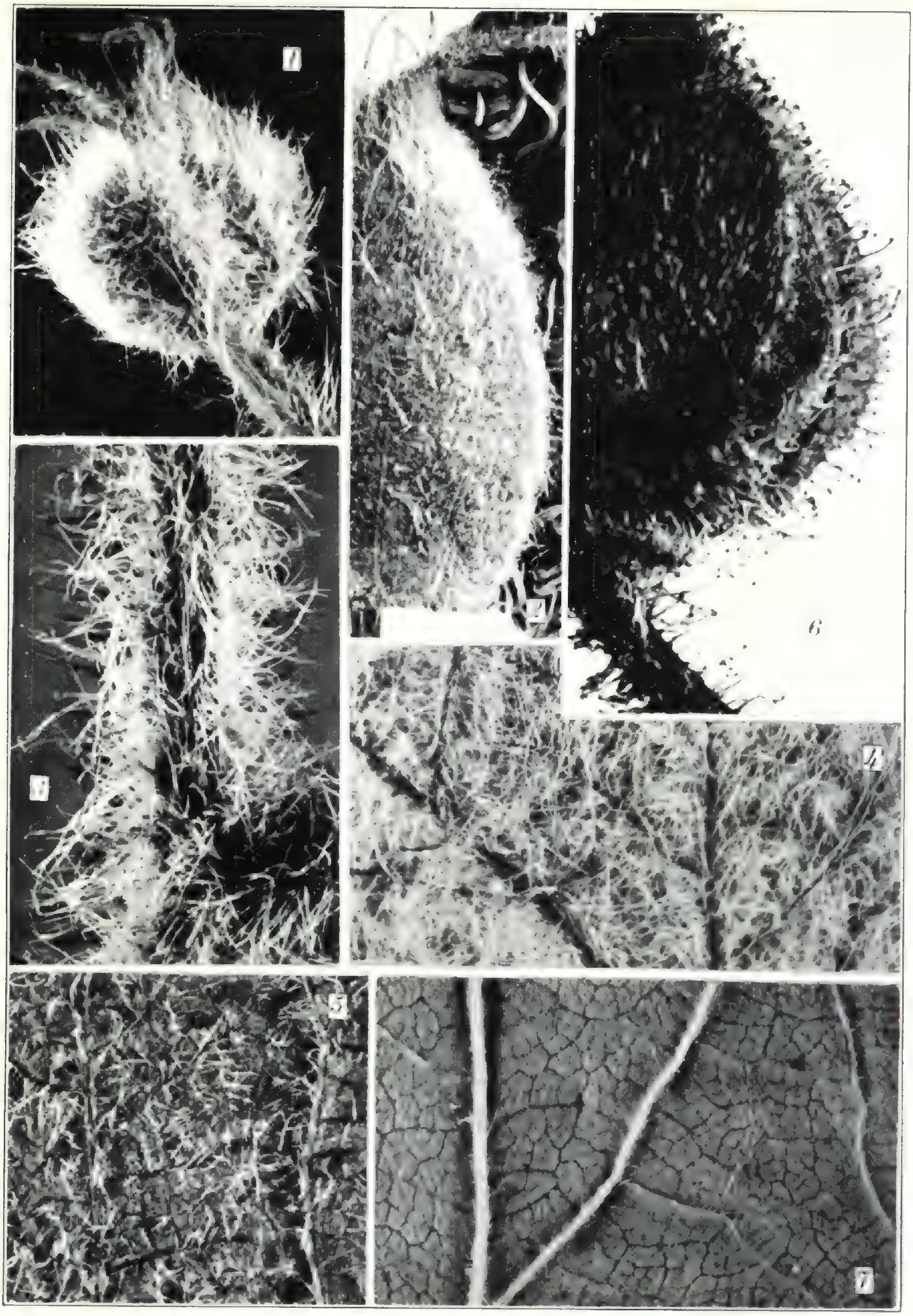


Photo. E. C. Ogden.

VARIETIES OF RUBUS PARVIFLORUS; all figs. × 10.

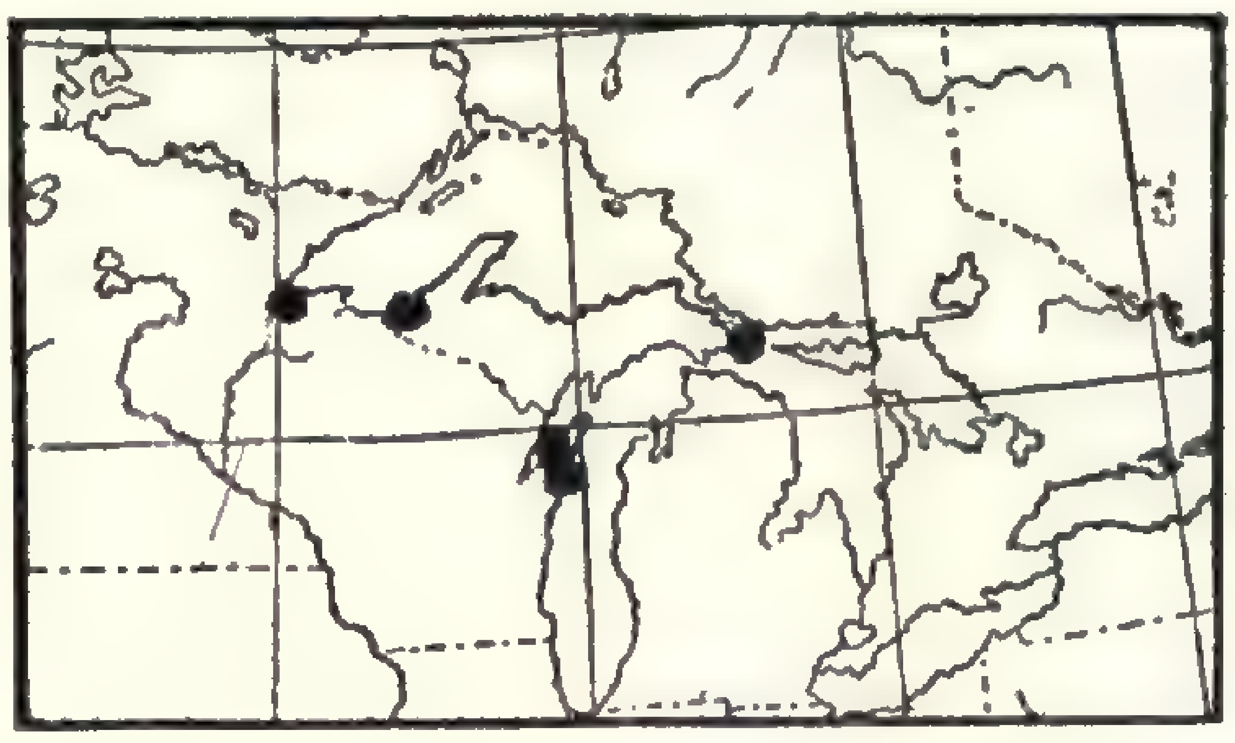
Var. GENUINUS: FIG. 1, young calyx; FIG. 2, portion of sepal; both from Michigan.
Var. VELUTINUS: FIG. 3, peduncle; FIG. 4, lower surface of leaf; both from California.
Var. HYPOMALACUS: FIG. 5, lower surface of leaf from Washington (TYPE).
Var. HETERADENIUS: FIG. 6, pedicel and calyx, from British Columbia; FIG. 7, lower surface of leaf, from Washington (TYPE).

Photo. E. C. Ogden.

VARIETIES OF RUBUS PARVIFLORUS; habit, × ⅖, details, × 10.
Var. GRANDIFLORUS: FIG. 4, pedicel and calyx, from South Dakota.
Var. SCOPULORUM: FIG. 5, pedicel, from Colorado.
Var. PARVIFOLIUS: FIG. 1, 2 plants; FIG. 2, calyx and pedicel; FIG. 3, lower surface of leaf; all from New Mexico.

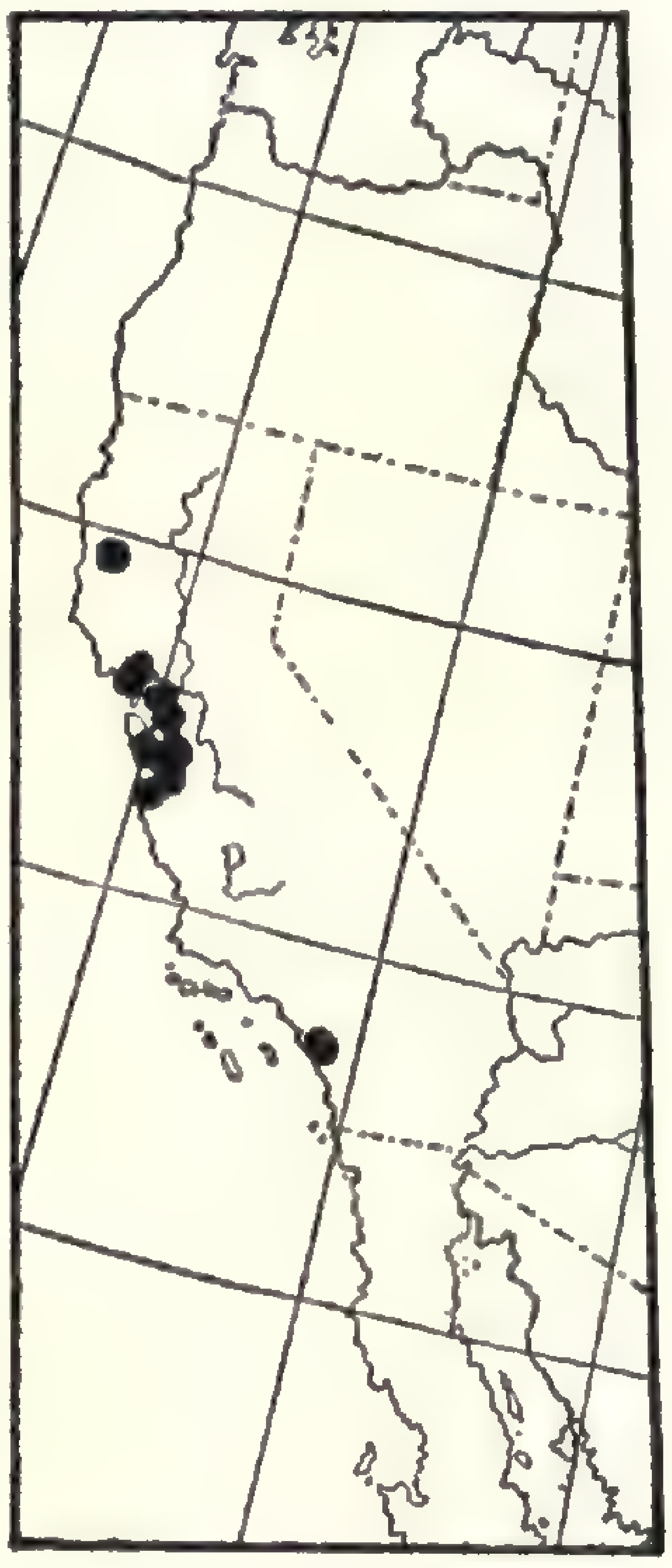
Shrubs 1.5–6 dm. high; leaves 0.5–1.3 dm. broad, minutely and sparsely pubescent to glabrate beneath; inflorescences 1–2 (–4)-flowered, their lowest pedicels 2–6 cm. long.
8. Var. *parvifolius.*

1. Rubus parviflorus Nutt., var. **genuinus** (Plate 364, figs. 1 and 2). *R. parviflorus* Nutt. Gen. i. 308 (1818). *R. nutkanus,* β, *Nuttallii* Torr. & Gr. Fl. N. Am. i. 450 (1840). *Rubacer parviflorum* (Nutt.) Rydb. Bull. Torr. Bot. Cl. xxx. 274 (1903), in small part, but as to type. *Bossekia parviflora* (Nutt.) Greene, Leaflets, i. 211 (1906), as to type. *R. nutkanus,* var. *parviflorus* (Nutt.) Focke, Bibl. Bot. xvii^{72}. 124 (1911), as to type.—Localized about the Upper Great Lakes in northern Michigan, Wisconsin (and presumably Minnesota). The following have been studied. Michigan: Mackinac Island, July, 1881, *T. E. Boyce,* no. 783 (topotype); upper reaches of Slate River and surrounding woods, Gogebic Co., August 25, 1919, *H. T. Darlington,* no. 3041 (Mich. State). Wisconsin: Stony Creek, Algoma, Kewaunee Co., July 24, 1929, *J. J. Davis* (Wisc.); Sturgeon Bay, Door Co., July 26, 1929, *J. J. Davis* (Wisc.); Superior, Douglas Co., June 30, 1927, *L. R. Wilson & L. M. Jones,* no. 279 (Wisc.). Map 15.



Map 15. Range of Rubus parviflorus, var. genuinus.

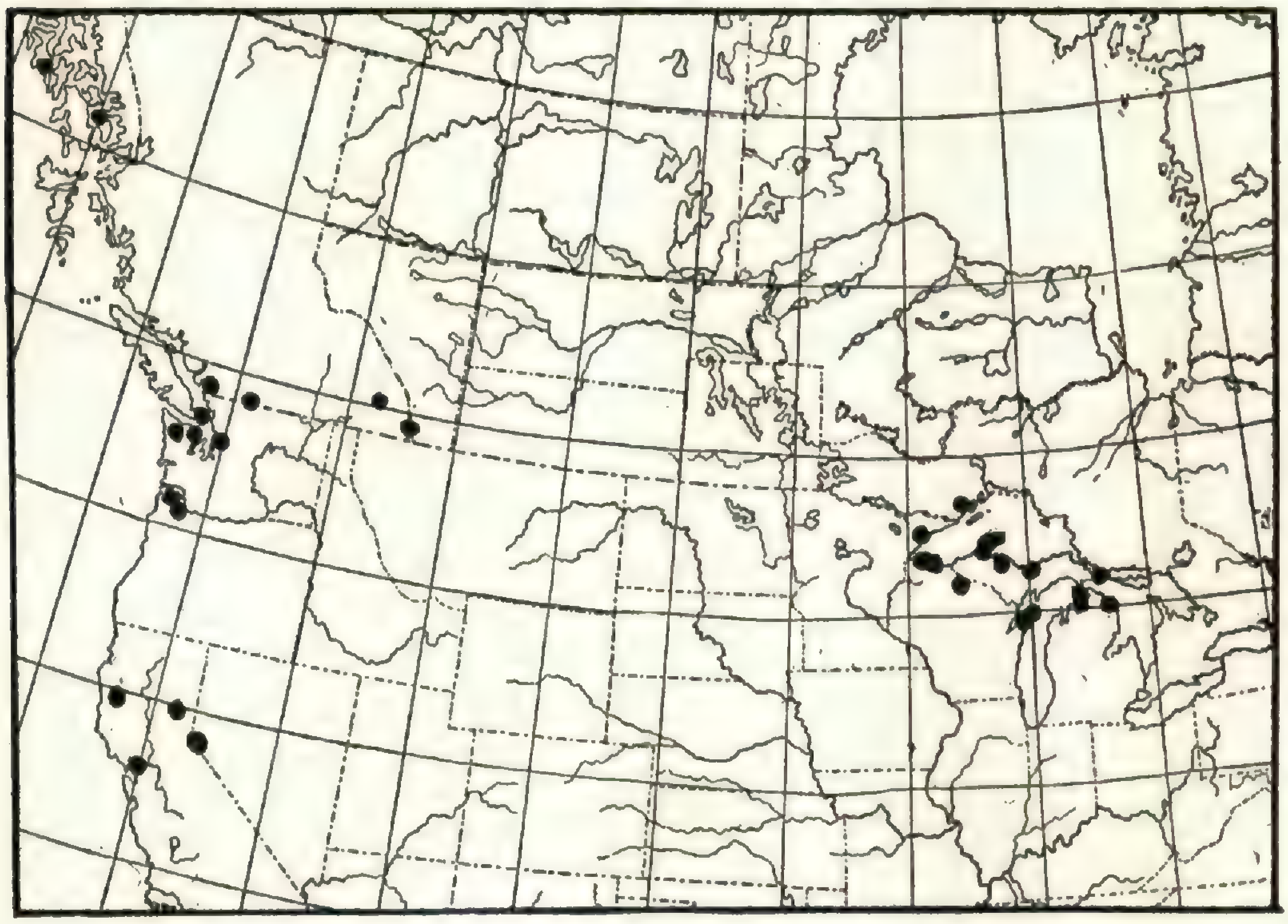
2. Var. velutinus (Hook. & Arn.) Greene, Bull. Torr. Bot. Cl. xvii. 14 (1890) (Plate 364, figs. 3 and 4). *R. velutinus* Hook. & Arn. Bot. Beech. Voy. 140 (1832), not Vest (1823). *R. nutkanus,* var. *velutinus* (Hook. & Arn.) Brewer, Bot. Calif. i. 172 (1876). *Rubacer tomentosum* Rydb. Bull. Torr. Bot. Cl. xxx. 274 (1903). *Rubacer velutinus* (Hook. & Arn.) Heller, Muhlenbergia, i. 106 (1904). *Rubus parviflorus,* var. *grandiflora* [*us*], subvar. *velutinus* (Hook. & Arn.) Farwell, Am. Midl. Nat. xi. 263 (1929).—Coastal region of California. Map 16.



Map 16. Range of Rubus parviflorus, var. velutinus.

3. Var. **hypomalacus,** var. nov. (tab. 364, fig. 5), foliis subtus subvelutinis; pedicellorum pedunculorumque glandulis stipitatis valde inaequalibus plerumque sordidis longioribus ad 1–2 mm. longis.—Southern Alaska to southern California, inland across southern British Columbia to the Canadian Rocky Mountains; about the Upper Great Lakes, northern Michigan, Wisconsin, Minnesota and adjacent Ontario. The following (selected from many specimens) are representative. Michigan: limestone till, Bois Blanc Island, Mackinac Co., *Ehlers,* no. 4852;

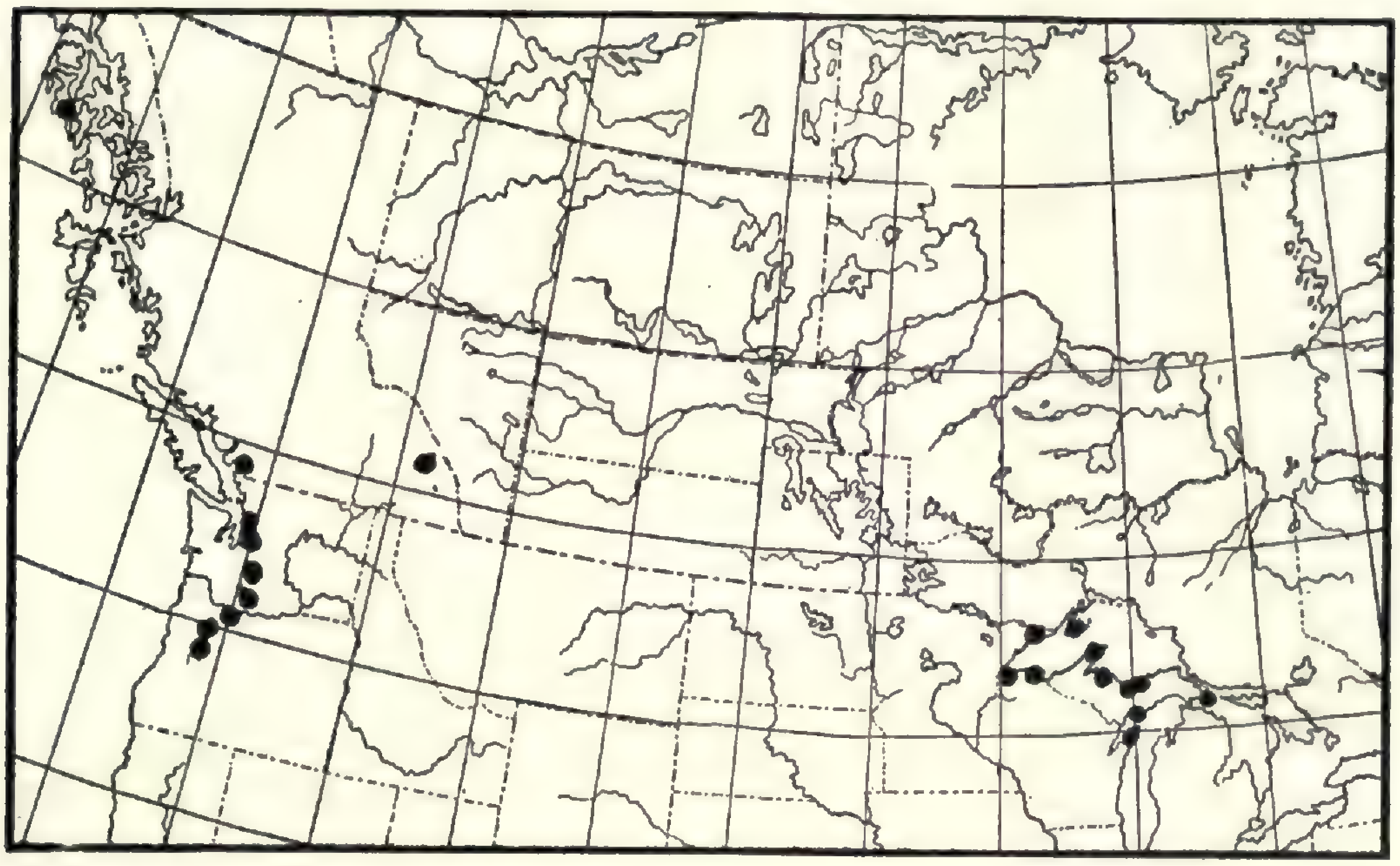
rich deciduous woods above Miner's Falls, near Munising, Alger Co., *Fernald & Pease*, no. 3388; along road to Mt. Mesnard, Marquette Co., August 3, 1906, *Dachnowski* (Mich.); edge of open woods, near Bear Lake, Houghton Co., *Hermann*, no. 389 (Mich.); "in peninsulâ Keweenaw, anno 1863," *J. W. Robbins;* Bête Grise, Keweenaw Co., *Hermann*, no. 337 (Mich.); north shore of Thunder Bay, Alpena Co., July 3, 1895, *C. F. Wheeler* (Mich. State); roadside between Cecil Bay and Big Stone Bay, Emmet Co., *C. O. Erlanson*, no. 303 (Mich.); coniferous woods near Cecil Bay, *Ehlers*, no. 2896 (Wisc.); mixed woods, Big Stone Bay, *Ehlers*, no. 503. Wisconsin: Whitefish Bay, west shore of Lake Michigan, June 22, 1866, *Lewis Foote* (Mich.); woods and fields, Ephraim, Door Co., *Pease*, no. 18,040; Clark Lake, Door Co., August 1, 1929, *J. J. Davis* (Wisc.); bank near Sand Lake, Lac du Flambeau Reservation, Vilas Co., *Fassett*, no. 10,827 (Wisc.); Sand Island, Lake Superior, *L. S. Cheney*, no. 6184 (Wisc.); Washburn, Bayfield Co., June 27, 1910, *E. H. Toole* (Wisc.); woods near Port Wing, Bayfield Co., June 14, 1928, *Griscom.* Minnesota: Two Harbors, Lake Co., June, 1893, *E. P. Sheldon.* Alaska: Stika, *Bongard;* clearing at beach, Tongas Village, *Walker*, no. 891. British Columbia: damp thickets, Kootenai Pass, *Dawson*, no. 139; shore of Howser Lake, Selkirk Mts., *Shaw*, no. 708; Chilliwack Valley, *J. M. Macoun*, no. 34,808; Vancouver, June 25, 1903, *J. Fowler* (Wisc.). Washington: Friday Harbor, San Juan Islands, *Zeller*, no. 757; Port Ludlow, June 15, 1889, *F. Binns;* foothills, Olympic Mts., *J. M. Grant*, no. 211 (type in Gray Herb.);



Map 17. Range of Rubus parviflorus, var. hypomalacus.

fields, Marysville, May, 1924, *J. M. Grant.* Oregon: Ross Slough, Coos Co., *H. H. Smith*, no. 3678; hillsides, Portland, August 30, 1889, *Drake & Dickson.* California: near John Day's, Mendocino Co., *Heller*, no. 5850; north slopes, Jonesville, Butte Co., *Copeland*, no. 419 (Wisc.); Berkeley, *W. W. Jones*, no. 161. Nevada: King's Cañon, Ormsby Co., *C. F. Baker*, no. 1097. Map 17.

In some of its specimens var. *hypomalacus* approaches the Californian var. *velutinus* but it differs in the shorter and more glandular pubescence of the calyx, in the less villous branchlets and, usually, in the sparser pubescence of the foliage. Doubtless var. *hypomalacus* has been the basis of some records of var. *velutinus* from north of California.

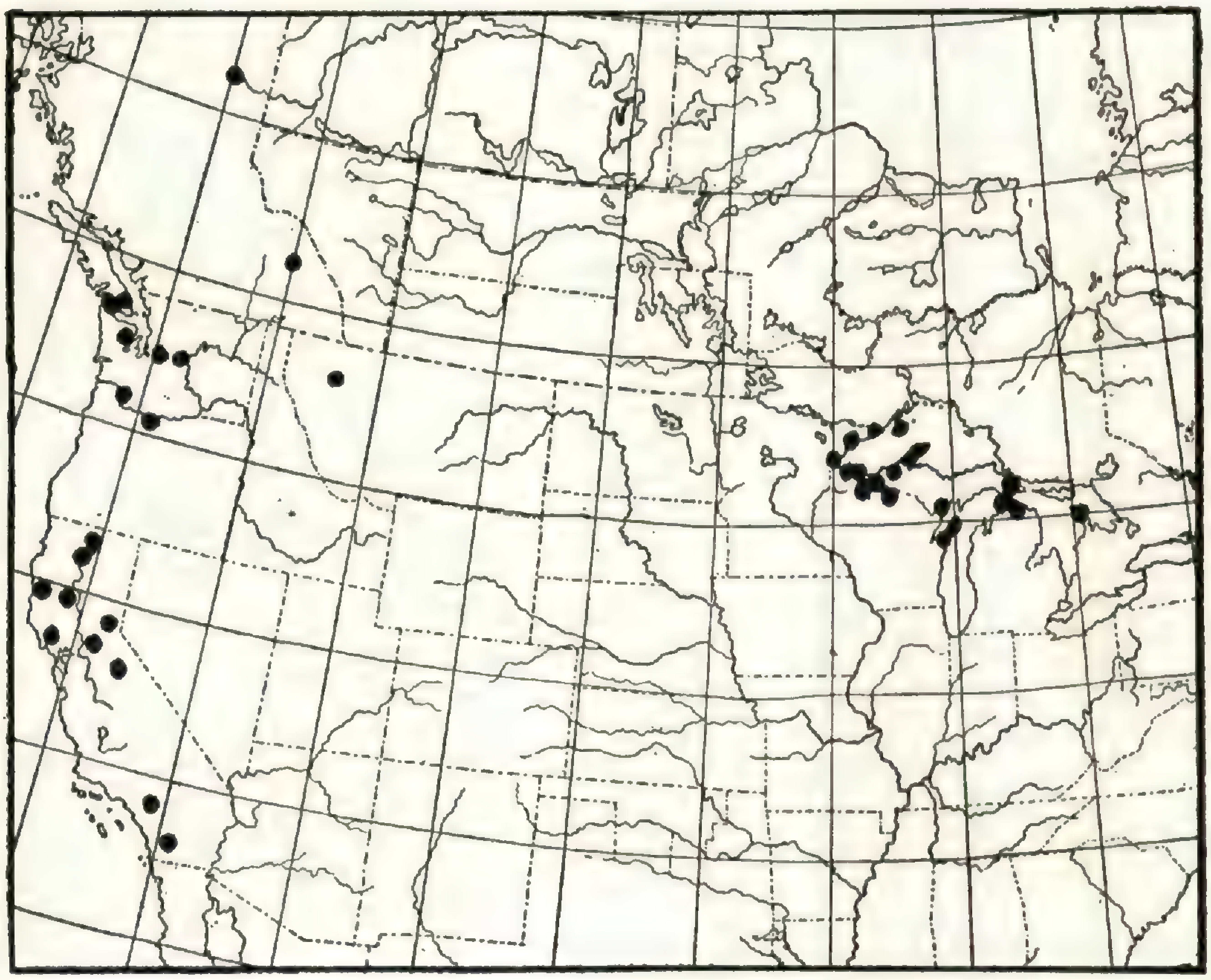


Map 18. Range of Rubus parviflorus, var. heteradenius.

4. Var. **heteradenius**, var. nov. (tab. 364, fig. 6), foliis subtus (nerviis exceptis) glabris vel glabratis; pedicellorum pedunculorumque glandulis valde inaequalibus plerumque sordidis longioribus ad 1–2 mm. longis.—Southern Alaska to Oregon and the Selkirk Mts. of British Columbia; region of Upper Great Lakes, Michigan, Wisconsin and Minnesota. The following are characteristic. Michigan: rocky woods, Bois Blanc Island, Mackinac Co., *Ehlers*, no. 4852 (Mich.); Negaunee, Marquette Co., July, 1871, *Mary H. Clark* (Mich.); "in peninsulâ Keweenaw, anno 1863," *J. W. Robbins;* Bête Grise, Keweenaw Co., *Hermann*, no. 337 (Mich.); border of open woods north of Garden, Delta Co., *Fernald & Pease*, no. 3389. Wisconsin: Door Co., July 1, 1883, *Schuette* (Wisc.); Madeline Island, Ashland Co., *Jackson & Sheldon*, no. 217 (Wisc.); Superior, August 23, 1893, *E. T. Harper* (Wisc.). Minnesota: woods and wooded hillsides, near

Hoveland, Cook Co., *Rosendahl & Butters*, no. 4627. Alaska: Sitka, *Bischoff*. British Columbia: Glacier, August 19, 1909, *Olson;* Vancouver, June 8, 1903, *J. Fowler* (Wisc.). Washington: fields, Marysville, May, 1922, *J. M. Grant* (Wisc.); grassy slopes, at 3000–4000 ft., Mt. Paddo, *Suksdorf*, no. 1758; on damp ground, Falcon Valley, June 26, 1893, *Suksdorf*, no. 1758 (type in Gray Herb.). Oregon: Willamette Hills, May, 1892, *Mulford;* along stream, Salem, *J. C. Nelson*, no. 1280. Map 18.

5. Var. **bifarius**, var. nov., foliis subtus subvelutinis; pedicellorum pedunculorumque glandulis stipitatis uniformibus plerumque pallidis vix 0.5 mm. longis.—British Columbia to southern California and northwestern Montana; region of Upper Great Lakes, Ontario, Michigan, Wisconsin and Minnesota. The following are characteristic. Ontario: Cameron Lake, Bruce Co., *Krotkov*, no. 7549. Michigan: open rocky woods, Prentis Bay, Mackinac Co., *Ehlers*, no. 1343 (Mich.); Eureka, Houghton Co., *Hermann*, no. 389 (Mich.); roadside near Silver Isle, Keweenaw Co., *Hermann*, no. 2187 (Mich.); edge of spruce woods near Bête Grise, Keweenaw Co., *Hermann*, no. 337 (Mich.); Isle Royale, 1868, *A. E. Foote* (Mich.); Ontonagan, 1860, *Mary H. Clark* (Mich.); gravel ridges Koss, Menominee Co., July 12, 1905, *C. A. Davis* (Mich.); banks of Limestone Creek, south of Mackinaw City, Cheboygan Co., *Ehlers*, no. 5261; shaded rich ground, near



Map 19. Range of Rubus parviflorus, var. bifarius.

Photo. E. C. Ogden

Chamaerhodos Nuttallii: fig. 3, branch, × 10, to show pubescence.
C. Nuttallii, var. keweenawensis: fig. 1, plant, × 1, from Keweenaw Peninsula; fig. 2, branch, × 10, to show pubescence.

Photo. E. C. Ogden.

POTENTILLA FRUTICOSA, forma VILLOSISSIMA: FIG. 1, fruiting branch, × 1; FIG. 2, leafy branch, × 1; FIG. 3, branchlet, × 3.

Grand Lake, Presque Isle Co., June 26, 1912, *C. K. Dodge* (Mich.). WISCONSIN: Washington Island, Door Co., July 3, 1931, *J. J. Davis* (Wisc.); rocky banks of Potato River, Gurney, Iron Co., *Newton Bobb*, no. 272 (Wisc.); Ashland, *Hermann*, no. 294 (Mich.); La Pointe, September, 1858, *Lapham* (Wisc.); mainland east of Sand Bay, Lake Superior, *L. S. Cheney*, no. 6275 (Wisc.); Wisconsin River, Newbold, *Cheney*, no. 1624 (Wisc.). MINNESOTA: opening in hardwoods, Grand Portage, Cook Co., *Butters & Buell*, no. 344; Two Harbors, Lake Co., *Sheldon*, nos. 4938, 5254 (Wisc.); Farquhar Point, Lake Superior, 1870, *J. C. Jones* (Mich.); near Duluth, July 5, 1893, *A. E. Gurd* (Mich.). MONTANA: woods, foot of Kootenai Mts., Big Fork, August 10, 1901, *Umbach*. BRITISH COLUMBIA: rich woods along Wicked River, near the Peace River, *Raup & Abbe*, no. 3800 (Arn. Arb.); banks near Cameron Lake, Vancouver Island, July 14, 1917, *W. R. Carter* (TYPE in Gray Herb.); thickets, District of Renfrew, *Rosendahl & Brand*, no. 3. WASHINGTON: Brinnon, Jefferson Co., *Beattie*, no. 3068 (Wisc.); Snoqualmie, August 8, 1924, *E. J. Kraus* (Wisc.); Kelso, August 8, 1924, *Kraus* (Wisc.); Peshastin, Okanagan Co., *Sandberg & Leiberg*, no. 542. OREGON: open woods, lower Hood River, 1924, *Henderson*, no. 892. CALIFORNIA: near John Day's, Mendocino Co., *Heller*, no. 5850; Goose Valley, Shasta Co., *Eastwood*, no. 883; between Upper Soda Spring and Shasta Retreat, Siskiyou Co., *Heller*, no. 7949; Yosemite Valley, alt. 4000–4500 feet, *Abrams*, no. 4367; wooded north slope, west of Bennett, Glenn Co., *Heller*, no. 11,979; ravine near Fallen Leaf Lake, Tahoe, *Smiley*, no. 361; Big Trees, Calaveras Co., *H. Mann;* vicinity of San Bernardino, alt. 6500 feet, *W. G. Wright*, no. 250; in shade near brook, Idyllwild, San Jacinto Mts., alt. 5300 feet, *M. F. Spencer*, no. 1731. MAP 19.

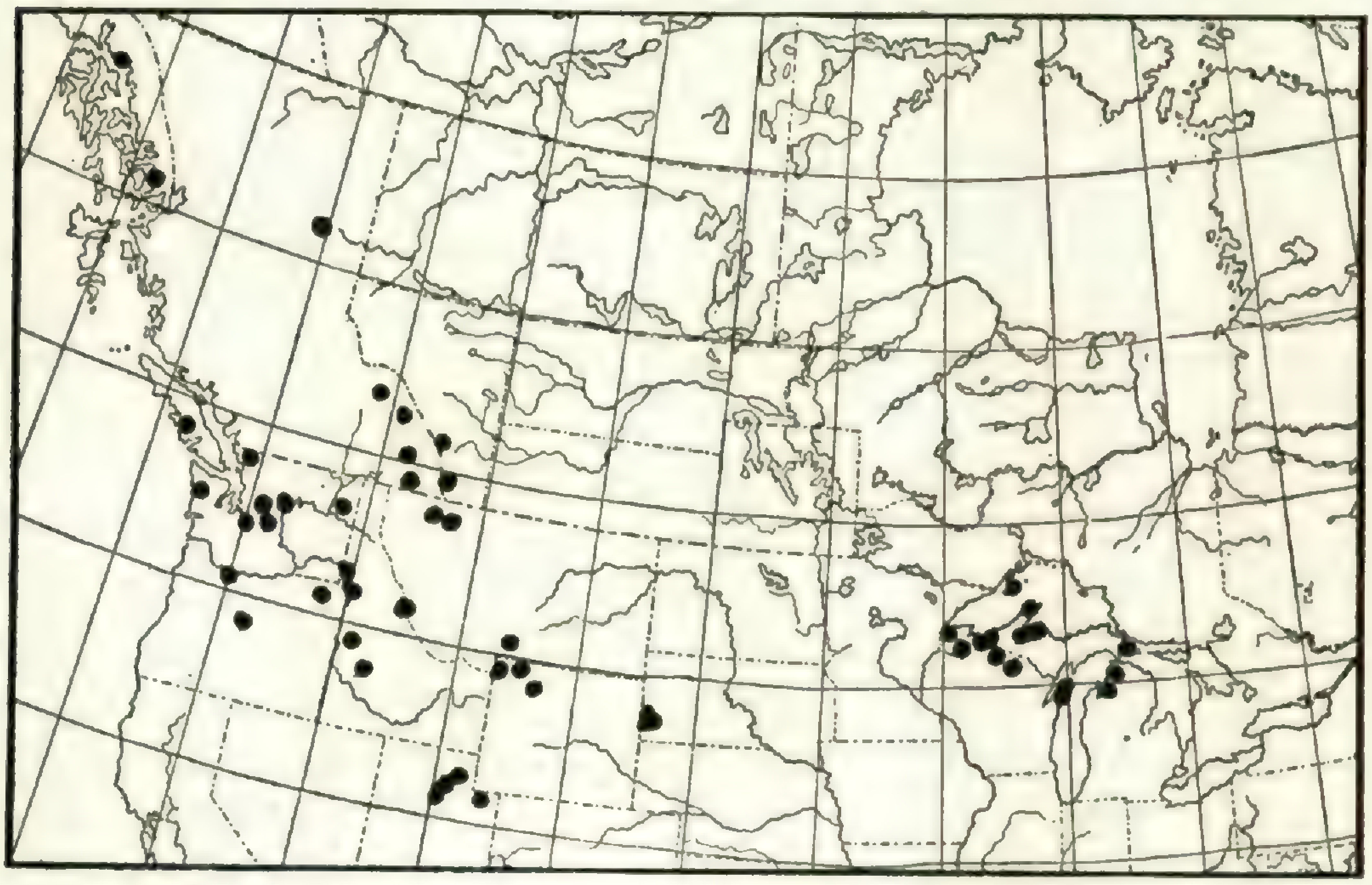
Var. BIFARIUS, forma **lacera** (Kuntze), comb. nov. *R. nutkanus*, f. *lacera* Kuntze, Meth. Sp. 102 (1879).—Vancouver Island, 1858, *Lyall*.

A sheet of the type-collection (in flower) in the Gray Herbarium is clearly a cut-leaved form of var. *bifarius*. Its leaves are cleft only 2/3–3/4 to the base. R. PARVIFLORUS, forma PEDATIFIDUS Hermann, RHODORA, xxxvii. 61, t. 326, fig. 2, has the leaves cleft to the base. It also is a form of var. *bifarius*.

Another form of *R. parviflorus*, presumably belonging to var. *bifarius*, is f. **Fraserianus** (J. K. Henry), comb. nov. *R. parviflorus*, var. *Fraserianus* J. K. Henry, Torreya, xviii. 54, fig. 1 (1918), a plant with leaves "rather densely pilose beneath" and differing from the ordinary forms in having the summits of the petals laciniate-dentate. It is described as "not common" at Ucleulet, Vancouver Island. It must be considered an aberrant form, not a true geographic variety.

6. Var. GRANDIFLORUS (as "GRANDIFLORA") Farwell, Am. Midl. Nat. xi. 263 (1929). (PLATE 365, FIG. 4.) *R. nutkanus* Moçino ex

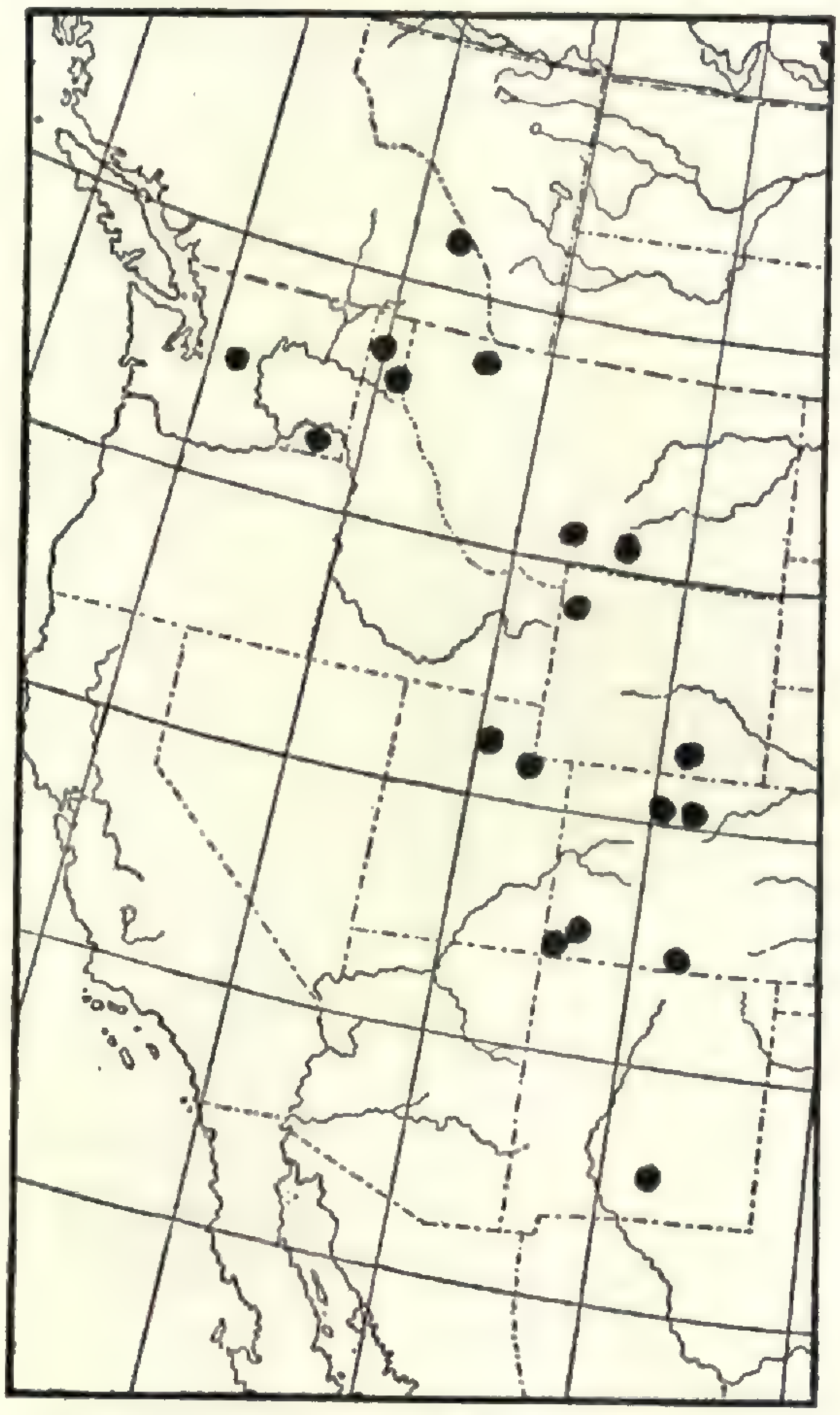
Seringe in DC. Prodr. ii. 566 (1825), inadequately characterized.—Southern Alaska to Oregon, Idaho, Utah and Wyoming; Black Hills, South Dakota; region of Upper Great Lakes, Michigan and Wisconsin (doubtless also Minnesota). The following are characteristic. Michigan: open woods, Prentis Bay, Mackinac Co., *Ehlers*, no. 1349 (Mich.); Marquette, *Pepoon*, no. 1563 (Mich.); shaded ground, Suger Loaf Mt., Marquette Co., July 3, 1916, *C. K. Dodge* (Mich.); L'Anse, Baraga Co., August 29, 1893, *S. R. Bailey* (Mich.); Elk Rapids, June 30, 1902, *Cooper* (Mich. State); Keweenaw Peninsula, 1863, *Robbins;* Isle Royale, *Stuntz & Allen*, no. 102; open woods, Rock Harbor, Isle Royale, *McFarlin*, no. 2004. Wisconsin: sandy woods, Washington Island, Door Co., *A. M. Fuller*, no. 1395 (Wisc.); Door Co., July, 1883, *Schuette;* lower 2 miles of Montreal River, *L. S. Cheney*, no. 5090 (Wisc.); Vilas Co., July 1, 1923, *S. I. Lilygren* (Wisc.); Mt. Whittlesey, Mellen, Ashland Co., *L. R. Wilson*, no. 10,135 (Wisc.); Grandfather Bull Falls, Lincoln Co., *Cheney*, no. 2471 (Wisc.); Drummond, *Cheney*, no. 4144 (Wisc.); Superior, Douglas Co., *Chas. Goessl*, no. 7843 (Wisc.) South Dakota: near Lead City, alt. 5500–6500 feet, *Rydberg*, no. 655; head of City Creek, alt. 5300 feet, *J. Murdoch*, jr., no. 3541; damp ravines, Pluma, *W. P. Carr*, no. 175. Montana: Decent to Ross' Hole, *S. Watson*, no. 103; woods, Midvale, *Umbach*, no. 412 (Wisc.); Lake McDonald, *Vreeland*, no. 933; Emigrant Gulch, *Rydberg & Bessey*, no. 4327. Idaho: copses above Lewiston, *Sandberg, MacDougal & Heller*, no. 300; Lake Waha, Nez Perces Co., June 22, 1896, *Heller* (Wisc.); timbered hillside, Tamarack, Washington Co., *J. A. Clark*, no. 225; creek-bank, Boise, *J. A. Clark*, no. 98. Wyoming: Crandall Creek, Clark's Fork Mts., August, 1881,



Map 20. Range of Rubus parviflorus, var. grandiflorus.

Forwood; wooded cañon, Yancey's, *Nelson & Nelson,* no. 5924. COLORADO: rocky slopes, Rabbit Ear Range, Routt Co., *Goodding,* no. 1596. UTAH: timbered gulch, Dyer Mine, Uintah Mts., *Goodding,* no. 1424; Red Butte Cañon, July 11, 1908, *Mrs. Joseph Clemens;* Wasatch Mts., at 7000 feet, *S. Watson,* no. 308; shady subalpine banks, alt. 8000–10,000 feet, Peterson Cañon, *Pammel & Blackwood,* no. 3803. ALASKA: Wrangell, *Walker,* no. 677; Juneau, June 25, 1899, *L. J. Cole* (Wisc.). BRITISH COLUMBIA: poplar-spruce forest, near head of Rocky Mountain Cañon, Peace River, *Raup & Abbe,* no. 3742 (Arn. Arb.); woods, Emerald Lake, Selkirk Mts., *Shaw,* no. 129; Carbonate, Selkirk Mts., *Shaw,* no. 188; thickets, Donald, July 3, 1885, *J. M. Macoun.* WASHINGTON: Clark Springs, Spokane Co., *Kraeger,* no. 37; mountains above Chelan, *Lake & Hull,* no. 502 (Wisc.) upper valley of the Nesqually, *O. D. Allen,* no. 25; valley of Swauk River, Kittitas Co., *S. P. Sharples,* no. 121; lake-shore, Quiniault, *Conard,* no. 103; Snoqualmie, August 12, 1924, *E. J. Kraus* (Wisc.); Bagley Lake, Whatcom Co., *J. W. Thompson,* no. 5358. OREGON: Mt. Emily, La Grande, Union Co., *H. P. Hansen,* no. 1078 (Wisc.); Crook Co., July 17, 1922, *Whited;* Bridal Veil, Multnomah Co., *H. H. Smith,* no. 3085. MAP 20.

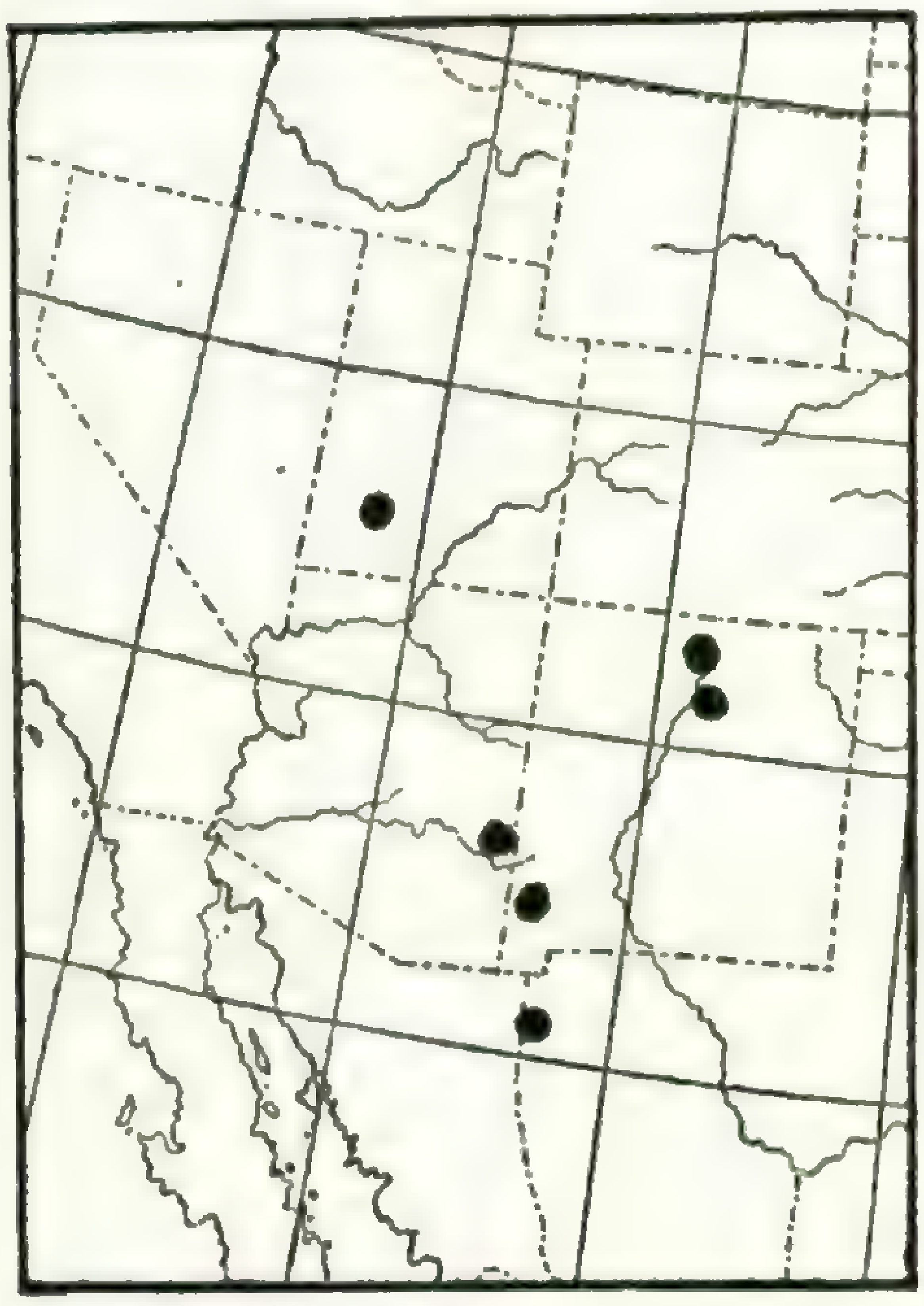
7. Var. **scopulorum** (Greene), comb. nov. (PLATE 365, FIG. 5). *R. nutkanus,* var. *scopulorum* Greene ex Focke, Bibl. Bot. xvii[72]. 124 (1911).—Southeastern British Columbia and central Washington to New Mexico. The following are characteristic. BRITISH COLUMBIA: Kicking Horse Valley, *S. Brown,* no. 481. WASHINGTON: Blue Mts., Columbia Co., *Horner,* no. B164; Snoqualmie, August 12, 1924, *E. J. Kraus* (Wisc.). IDAHO: valley of North Fork of Coeur d'Alene River, *Leiberg,* no. 1525; woods, Sand Point, *Umbach,* no. 424 (Wisc.). MONTANA: coniferous woods, Lake Josephine Trail, Glacier Nat. Park, *McLaughlin,* no. 718 (Wisc.); West Rosebud River, alt. 7000 feet, July 11, 1923, *P. H. Hawkins* (Wisc.); Spanish Creek, Gallatin Co., July 15, 1901, *Vogel.* WYOMING: Jennings Lake, Jackson Hole, *Merrill & Wilcox,* no. 916; Centennial Valley, *Nelson,* no. 1676.



MAP 21. Range of RUBUS PARVIFLORUS, var. SCOPULORUM.

Utah: Big Cottonwood Cañon, Salt Lake Co., *O. A. Garrett*, no. 1685; wooded slope near Stillwater Fork, Uintah Mts., *Payson & Payson*, no. 5147. Colorado: forest, gulch west of Bear River, alt. 7000 feet, *Crandall*, no. 195; headwaters of Clear Creek, *Parry*, no. 211; mountains about Steamboat Springs, Routt Co., July 15, 1902, *G. E. Osterhout* (Wisc.); bottom of La Plata Cañon, *Baker, Earle & Tracy*, no. 680. New Mexico: Sierra Blanca Peak, Otero Co., *C. B. Wolf*, no. 2858. Map 21.

8. Var. **parvifolius** (Gray), comb. nov. (Plate 365, figs. 1–3). *R. nutkanus*, var. *parvifolius* Gray, Pl. Fendl., Mem. Amer. Acad. ser. 2, iv. 42 (1849).—Utah and New Mexico to northern Chihuahua. Utah: City Creek Canon, June 4, 1883, *F. E. Leonard.* New Mexico: shady banks of Santa Fé Creek, June, July, 1847, *Fendler*, no. 208 (type); Winsor's Ranch, alt. 8400 feet, Pecos River National Forest, *Standley*, no. 4032; 10 miles east of Mogollon, at 8700 feet, Mogollon Mts., Catron Co., *C. B. Wolf*, no. 2711; Mogollon Creek, at 7500 feet, Socorro Co., *Metcalf*, no. 281. Arizona: in timber, Thompson Ranch, Black River, *Goodding*, no. 576. Mexico: mountains 15–20 miles south of Pacheco, Chihuahua, *C. V. Hartman*, no. 696. Map 22.



Map 22. Range of Rubus parviflorus, var. parvifolius.

Chamaerhodos Nuttallii Pickering, var. **keweenawensis**, var. nov. (tab. 366, figs. 1 et 2), caulibus ramisque valde hispidis, pilis ad 1.5 mm. longis.—Keweenaw County, Michigan: wind-swept crests, crevices and talus of sandstone-conglomerate, West Bluff, July 4, 1934, *Fernald & Pease*, no. 3376 (type in Gray Herb.). See p. 213 and map 10.

Chamaerhodos Nuttallii Pickering in Torr. & Gray, Fl. N. Am. i. 433 (1840), as synonym of *C. erecta* β. *Nuttallii* T. & G., l. c. (1840), Rydberg, N. Am. Fl. xxii. 377 (1908), validating the name, was based on *Sibbaldia erecta* β. *parviflora* Nutt. Gen. N. Am. Pl. i. 207 (1818), from "the highest gravelly hills, 10 to 15 miles from the Mandan villages." *C. Nuttallii*, found on arid plains and crests from Yukon to Colorado, east to Manitoba and western Minnesota, has the stem and branches densely glandular and at most minutely pilose. Its pubescence is well displayed in fig. 3, made from plants collected in the type region, dry hilltop, Mandan, North Dakota, June 23, 1912

TYPE OF GEUM VIRGINIANUM

(Specimen in Linnean Herbarium; photograph from Mr. *S. Savage*).

GEUM ALEPPICUM
(after *Jacquin*).

by *O. A. Stevens.* The plant of the Keweenaw region, isolated by 375 miles from typical *C. Nuttallii,* is consistently hispid (as well as glandular) as shown in FIG. 2.

WALDSTEINIA FRAGARIOIDES (Michx.) Tratt., var. **parviflora** (Small), comb. nov. *W. parviflora,* Small, Bull. Torr. Bot. Cl. xxv. 137 (1898).

Waldsteinia fragarioides, like *Fragaria virginiana,* has petals highly variable in size as well as outline. When Small published *W. parviflora* as a new southern species he stated that "The new species may be distinguished from *W. fragarioides* by the more prominent disc, the small sessile petals which are about as long as the calyx-segments or shorter, and the larger obovoid achene." Later Rydberg, in N. Am. Fl. xxii^5. 398 (1913), reduced *W. parviflora* to *W. Doniana* Tratt., the latter based on the description and plate of a plant introduced into English gardens by George Don and illustrated as *Dalibarda fragarioides* in Bot. Mag. xxxviii. t. 1567 (1813); and in his Manual Small accepts this reduction, stating his conception of the differences between *W. fragarioides* and *W. Doniana* as follows:

Petals twice as long as the sepals or longer; sepals mostly longer than the hypanthium . . . . 1. *W. fragarioides.*
Petals as long as the sepals or shorter; sepals mostly shorter than the hypanthium . . . . 2. *W. Doniana.*

There is no evident or stated difference in the foliage and both plants show the same range of pubescence. If the distinction in the calyx given in Small's key is compared with the original plate of *W. Doniana* an unfortunate contradiction will be noted: the original plate of *W. Doniana* shows the hypanthia 3–4 mm. long, the lanceolate sepals 6.5–10 mm. long. In fact, *W. Doniana* is one of the extremes of *W. fragarioides* with longest rather than shortest sepals. In having the petals shorter than the exaggeratedly long sepals it differs from the more general run of *W. fragarioides* in the North, but its petals, correctly described "oblong-ovate," are shown in the plate up to 7 mm. long and 3.5 mm. broad, a measurement near the average for the northern plant. *W. parviflora,* under the misleading alias, *W. Doniana,* is defined as having "sepals triangular-lanceolate, . . . 2.5–3 mm. long" (*Rydberg*), "petals 2–4 mm. long" (*Small*).

I am, therefore, unable to see that *Waldsteinia Doniana* is quite identical with *W. parviflora.* It seems to me a garden-development in which, presumably through unwonted nutrition, the sepals became exaggeratedly large, the petals remaining fairly typical for *W. fragari-*

oides. In the northern half of the range of *W. fragarioides* (New England to Ontario and Wisconsin) I get the following measurements

Locality	Length of Hypanthium	Length of Sepal	Length of Petal	Breadth of Petal
1. Monmouth, Maine	3 mm.	5 mm.	8 mm.	3.2 mm.
2. Benton, Maine	2.5	3.5	6	4
3. Hanover, New Hampshire	2	4.5	6	3.7
4. Lebanon, New Hampshire	2	4.5	7	3.5
5. St. Johnsbury, Vermont	2	2.5	5	2.5
6. Brandon, Vermont	2.5	5.5	9.5	5
7. Charlotte, Vermont	3	5.5	6	4.5
8. Middlebury, Vermont	2	4.5	7	4.5
9. Fair Haven, Vermont	3.5	5	6	3
10. Sudbury, Vermont	2	2.3–3	3.5	3
11. Poultney, Vermont	2	2.7	4.5	3
12. Brandon, Vermont	3.5	5.5	10	5
13. Coleraine, Massachusetts	3	3.5	8.5	6
14. Greenfield, Massachusetts	2.3	4	7	3.2
15. Greenfield, Massachusetts	4	6.5	10	5
16. Pittsfield, Massachusetts	2	4	7.5	4
17. Elmira, New York	2.5	5	5.5	3
18. Canadice, New York	2.5	5.5	8	3
19. Bainbridge, New York	3	4	6	5
20. Vaughns, New York	3	7.5	10	5.5
21. Newcomb, New York	2	3.8	4	2.8
22. Wingham, Ontario	3	2.7	6	2
23. Brittania, Ontario	2.5	4	6	3
24. Kingston, Ontario	3	5	6	3.5
25. Depere, Wisconsin	2.5	3.5	5	3.3
26. Lake Owen, Wisconsin	2	4	5.5	3

In the southern half of the range, down the Alleghanies, the measurements are similarly variable; but in the mountains from Virginia to Tennessee and Georgia there occurs an extreme plant with tiny petals, *Walsteinia parviflora* Small. There are only three sheets of it in the Gray Herbarium, but the measurements, while in most points overlapping those of the more northern *W. fragarioides,* indicate a fairly marked geographic variety, with very narrow and short petals:

Locality	Length of Hypanthium	Length of Sepal	Length of Petal	Breadth of Petal
Mts. North Carolina	2.5–3.5	3–4	3.5–4	1.5
Harriman, Tennessee	2–2.5	3–3.5	3.5	1.5
Northern Georgia	2.5	3–4.5	2.5	1

Potentilla pensylvanica L. Ontario: sandy plain, Espanola, Sudbury Distr., no. 3378; sandy ground, site of Hudson Bay Co. post, Agawa Bay, Algoma Distr., *Pease,* no. 17,965. Michigan: Isle Royale, July 21, 1909, *Cooper;* wind-swept crests, crevices and talus of sandstone-conglomerate, West Bluff, no. 3379.

This is the plant treated by Rydberg as *Potentilla pensylvanica* L. Rydberg, in 1898, gave the range: "a comparatively rare plant,

ranging in British America from Hudson Bay to the Rockies, and in these extends southward to Colorado";[1] in 1908 he gave a similar range for his *P. pensylvanica:* "On the plains from Hudson Bay to the Yukon Territory and Colorado."[2] This species has the radical leaves definitely "pinnate with 7–15 leaflets, . . . leaflets gradually reduced downward, . . . divided . . . into oblong divisions" (*Rydberg*) and its easternmost known stations are on the west side of Hudson Bay and near the shores of Lakes Superior and Huron.

There has been much uncertainty regarding the exact typification of *Potentilla pensylvanica.* The Linnean account was as follows:

> *pensyluanica* 28. POTENTILLA foliis inferioribus pinnatis, superioribus ternatis: foliolis inciso-serratis, caule erecto pubescente.
> Pentaphylloides canadense, foliis agrimoniae. *Boerh. lugdb. I. p. 40.*
> *Habitat* in Canada. ♃.
> Folia Radicalia *pinnata: foliolis oblongis, obtusiusculis, serrato-dentatis, lineatis, mollibus, villosis: extimis tribus coadunatis maioribus; int[f]erioribus minoribus alternis.* Caulina *subdigitata, septena, ut P. recta, sed pinnatifida.* Petala *vix calyce maiora.* Habitus *P. rectae.* H. U. [Hortus Upsaliensis].[3]

From the habitat "Canada" and from the citation of Boerhaave's plant, which he had received through Sarrasin, who was physician of the Court of Quebec, it is natural to infer that the name *P. pensylvanica* belongs to the plant of coastal rocks and gravels which abounds on the lower St. Lawrence, thence northeastward through the Straits of Belle Isle and southward to the coast of New Hampshire. In 1896, Rydberg described the latter as *P. litoralis* Bull. Torr. Bot. Cl. xxiii. 264 (1896), characterized by "Leaves pinnate, of two approximate pairs of leaflets, the lower the smaller, or subdigitately 5-foliolate." Slightly thereafter, in his *Monograph* (1898) Rydberg maintained the plant of the eastern coast as *P. litoralis,* the plant of the Great Plains as *P. pensylvanica;* but he threw doubt into the situation by saying in his discussion of the western "*P. pensylvanica*": "There is some doubt as to whether this is the true *P. Pennsylvanica* L. The description of the leaves of that species seems to indicate rather *P. litoralis*" (p. 96). Under the treatment of the latter he correctly summarized the difference in the range of the two: "*P. litoralis* is principally a beach plant, or at least growing near the coast, while *P. Pennsylvanica*

[1] Rydb. Mon. N. A. Potent., Mem. Dept. Bot. Columb. Univ. ii. 97 (1898).
[2] Rydb. N. Am. Fl. xxii. 350 (1908).
[3] L. Mant. 76 (1767).

is an inland, plain or mountain species." *P. litoralis* was well illustrated in Rydb. Mem. Dept. Bot. Columbia Univ. ii. t. 37, figs. 1–5.

Subsequently (1908), without repeating the doubt he had expressed in 1898, Rydberg maintained the inland species with elongate, pinnate leaves of 7–11 leaflets as *P. pensylvanica*, the eastern coastal plant as *P. pectinata* Raf. Aut. Bot. 164 (1840). Rafinesque's account was unusually good:

> 1204, *Pot. pectinata* Raf. Pensylv. L. Tor[rey]. rare sp. of Canada and Boreal America, not of Pennsylvania: leaves hardly pinnatiform, rather digitate, 3–7folioles cuneate narrow pectinate, stipules lanceol. 2–3parted, stem bifurcate, calix linear lanceol. hirsute.

Potentilla pectinata Raf. (1840) and *P. litoralis* Rydb. (1896) are, then, synonyms, both belonging to the eastern coastal species. In view, however, of the facts, that Canada of Linnean time was primarily Quebec, that the Sarrasin specimen, which Boerhaave had, presumably came from the shores of the lower St. Lawrence, and that Rydberg had, himself, doubted in 1898 whether the eastern, rather than the western plant should stand as *P. pensylvanica*, it has seemed wise to settle the question. Through the always accommodating Assistant Secretary of the Linnean Society of London, Mr. S. Savage, I have a photograph of the Linnean type. Mr. Savage's letter accompanying it states that

> I now send you a photograph of the type specimen of *Potentilla pensylvanica* Herb. Linn. The inscriptions on this sheet are as follows:
> *Ard* [= Arduino], in Linnaeus's hand.
> *pensylvanica*, in Linnaeus's hand.
> Label in bottom right hand corner,—*13* in Arduino's hand, and *pensylvanica* in Linnaeus's hand.

The specimen which Linnaeus had before him and described in detail, even to the 7 lobes of the upper leaflets of the cauline leaves, is clearly the type; it is the specimen of which Torrey wrote in 1824: "*Sir J. E. Smith* informs me, that *P. pennsylvanica* of the Linnean Herbarium resembles *P. recta* in shape of leaflets and serratures, but is pinnate and very soft-downy."[1]

That it is a phase of the inland plant there can be no question; and that the name *pensylvanica* is quite as inappropriate for it as it would be for the Canadian and New England *P. pectinata* is equally obvious. In explanation of the misleading specific name published by Linnaeus a second letter from Mr. Savage is illuminating. Following up the source of *P. pensylvanica*, he finds that Linnaeus received it from

[1] Torr. Fl. N. Mid. U. S. 499 (1824).

Arduino some time subsequent to the publication of Species Plantarum ed. 2 (1762-63), and that the manuscript list of the specimens received at that time has in Linnaeus's hand the entry:

13. PENTAPHYLLOID. CANADENSE. *Potentilla canadensis* non habeo in speciebus accepi nuper ab aliis pulcherrimum specimen.

Since Linnaeus had already published the quite different *Potentilla canadensis* Sp. Pl. i. 498 (1753), it is evident that he adopted for the plant received from Arduino and published as *P. pensylvanica* (1767) a substitute-name which he thought to be equally appropriate.

With the type of *Potentilla pensylvanica* now settled, it becomes necessary to decide to what American species it belongs. I am unable, in the first place, to maintain as distinct species the plants kept up in the North American Flora as *P. pensylvanica* and *P. strigosa.* Others of the segregates seem to me conspecific but these, being later published, need not now concern us. The range of *P. pensylvanica,* as stated by Rydberg, has already been given. That of *P. strigosa* is amazingly similar, except for the inclusion of Asia: "Plains from Hudson Bay to Kansas, New Mexcio, and British Columbia; also northern Asia, according to Lehmann."

Rydberg's *Potentilla pensylvanica* is keyed by him (N. Am. Fl.) under "Petioles and stem appressed-pubescent" and the fuller diagnosis says "stem . . . more or less appressed-pubescent and tomentulose" while in the parallel definitions (key and diagnosis) *P. strigosa* is under "Petioles and stem with spreading hairs" and "stems . . . with long spreading hairs." Pubescence of "long spreading hairs" is not what one would expect of a plant called *strigosa,* for *striga* was originally a swath of mowed hay or grain (lying flat) and in modern scientific terminology *strigae* are defined as "sharp close-pressed rigid hairs" (*Lindley,* Treas. Bot.), and the adjective strigose (*strigosus*) as "covered with strigae" (*Lindley*), "beset with *appressed* sharp straight and stiff hairs" (*Gray*) or "beset with sharp-pointed *appressed* straight and stiff hairs or bristles" (*Jackson*) [Italics mine].

In 1898, when he treated *Potentilla strigosa* as a variety of *P. pensylvanica,* Rydberg regarded "typical *P. Pennsylvanica* . . . a comparatively rare plant," while *P. pensylvanica,* var. *strigosa* was "the most common form of *P. Pennsylvanica,* found in the same range as the species." That the two are separated only by illusory differences is clearly indicated by some of the plates specially selected by Rydberg as illustrating them. The first synonym under Rydberg's *P. pensylvanica* (N. Am. Fl. p. 350) is *P. missourica* Hornem. in Lindl.

Bot. Reg. xvii. t. 1412 (1831). The plate is one of Hart's characteristic drawings and it is significant that the horizontally spreading or even slightly reflexed stiff hairs are shown uniformly on the stem, petiole and rachis. As an illustration of Rydberg's *P. pensylvanica* with "Petioles and stem appressed-pubescent" it is very contradictory; as an illustration of his *P. strigosa* with "Petioles and stem with spreading hairs" it would be thoroughly characteristic. The hairs shown on the plate of the type of *P. missourica* are positively divergent; those shown in the plate (Mem. Dept. Bot. Columbia Univ. ii. t. 38, fig. 2) selected to illustrate the plant "with spreading hairs" are not strongly spreading. The futility of trying to maintain two species, "found in the same range" and with no stronger difference than that emphasized in the North American Flora is apparent.

Returning to the question of what *Potentilla strigosa* really is, it becomes necessary to review the somewhat inconclusive history of the name. Pallas, the great explorer and early writer on the flora of Siberia, left an Asiatic specimen marked *Potentilla strigosa.* Pursh, taking up *P. pensylvanica* for the plant of "Canada and New England" (i. e. *P. pectinata*), found the specimen of the undefined *P. strigosa* Pallas in Lambert's herbarium, and taking it to be a variety of the plant of the eastern American coast, called it *P. pensylvanica,*

strigosa. β. P. cano-pubescens; foliis pectinato-dentatis margine revolutis, floribus corymbosis.
P. strigosa. *Pallas in Herb. Lambert.*
Icon. *Gmel. sib. 3. t. 34. f.* 1.
............β. on the Missouri................
............*β. v. s. in Herb. Lewis*............
........The variety β. appears to be a distinct species.[1]

The plant of the Missouri, collected by Capt. Lewis and described by Pursh "cano-pubescens" (not necessarily "with long spreading hairs") was supposed by Pursh to be the undescribed *P. strigosa* Pallas of Asia and the varietal name *P. pensylvanica,* β. *strigosa* Pursh consequently rests, at least in intent, partly upon the Siberian plant, which will now be checked. Pursh also cited a plate of a Siberian plant, one of Gmelin's very crude drawings which is not clearly referable by citation to any species discussed in Gmelin's text nor to anything North American. Regarding Gmelin's plate Trattinnick specially commented: "Quoad iconem Gmelini et notas a Purshio tributas non potest esse eadem cum P. pensylvanica."[2] That element

[1] Pursh, Fl. Am. Sept. 356 (1814).
[2] Tratt. Rosac. Mon. iv. 31 (1824).

of Pursh's concept may be dismissed as having nothing to do with the plant of the Missouri which Pursh specially described.

The Pallas plant, *P. strigosa*, was formally recognized as a species (and thus validated) by Trattinnick in 1824. Trattinnick's treatment follows:

POTENTILLA *strigòsa. Pallas.*

P. cano-pubescens; foliis pectinato-dentatis, margine revolutis, floribus corymbosis. Pursh.

Potentilla strigosa. Pall. in herb. Lambert.

Potentilla pensylvanica β. strigosa. Pursh. fl. Amer. sept. ed. 2. I. 356. Lehm. Potent. p. 55. Poir. Encycl. Suppl. IV. 543.

Potentilla foliis duplicato-pinnatis, venatis, valde exstantibus, subtus albicantibus, caule corymboso. Gmel. fl. sibir. III. p. 181. t. 34. f. 1.

Hab. in Sibiria, nec non ad Missurim fluvium in provincia Luisiana Amer. sept.

This account by Trattinnick, followed by the statement above quoted, that Gmelin's plate 34, fig. 1 does not belong to *Potentilla pensylvanica*, validly launched *P. strigosa* as a specific name. It is evident, however, that it was still as confused in the mind of Trattinnick as it had been with Pursh, but that Trattinnick made *P. strigosa* primarily Siberian. Many sheets of Asiatic plants distributed as *P. pensylvanica* or as *P. strigosa* are in the Gray Herbarium. About one half of those called *P. pensylvanica* are *P. chinensis* Seringe, the other half *P. niponica* Wolf; while the five sheets from the Altai sent out by Bunge and by Fischer as *P. strigosa* are quite unlike anything on our western plains.

If *Potentilla strigosa* Pallas is to be interpreted as the Siberian plant which Pallas had, then the name cannot be used for a wholly different North American species. If *P. strigosa* Pallas, first validly published as a species by Trattinnick in 1824, rests upon *P. pensylvanica* β. *strigosa* Pursh, of North America, it must not be overlooked that Pursh intentionally took the name from Pallas. At best the concept was from the start a confused one; to maintain the name *P. strigosa* Pallas for a strictly North American species would completely misinterpret Pallas's intention.

Chronologically, the next-published specific name for the characteristic plant of the Great Plains, which has been erroneously passing as *P. pensylvanica* and *P. strigosa* is *P. missourica* Hornem. in Lindl. Bot. Reg. xvii. t. 1412 (1831). This, although based on a very luxuriant garden specimen, is without question our plant. The name given by Horneman, without explanation, suggests that he was using it, correctly, because his species was that brought back by Capt.

Lewis from the Missouri and described by Pursh as *P. pensylvanica*, β. *strigosa.* The name *P. missourica* is unequivocal; and by those who see a specific line separating it from *P. pensylvanica* it should be used for the plant which Rydberg maintained as *P. strigosa.* As sufficiently emphasized, I can find no such line of cleavage.

Potentilla fruticosa L., forma **villosissima,** f. nov. (tab. 367), ramulis stipulis foliis utrinque dense albido-villosis, villis subsericiis; caulibus adscendentibus 3–6 dm. altis; foliis plerumque 5-foliolatis, foliolis ad 1.5 cm. longis.—Ontario: limestone pavement and gravel, Great Cloche Island, Manitoulin District, June 29, 1934, *Fernald & Pease*, no. 3382. (type in Gray Herb.).

I hesitate to add to the many described forms of the polymorphic *Potentilla fruticosa*, especially since these numerous variations over the Northern Hemisphere have not been properly systematized. I can find none of the described variations, however, to which the extremely white-villous form of Great Cloche Island can be referred. That it is an ecological form rather than a geographically segregated variety is indicated by its passing very definitely on Great Cloche Island into the less villous or greenish-leaved shrub in the less xerophytic situations. Plate 367 shows typical branches, with an enlarged portion (fig. 2) to illustrate the dense villosity.

P. simplex Michx. See Fern., Rhodora, xxxiii. 188, t. 215, fig. 1 (1931). Ontario: dry ledges along the river, Massey, no. 3383.

Known range in Ontario extended north from shores of Lakes Ontario and Erie.

Geum laciniatum Murr. Comm. Novi. Gott. v. 30, t. 2 (1774); F. Bolle in Fedde, Repert. Beih. lxxii. 55 (1933). *G. virginianum*, var. *Murrayanum* Fern. Rhodora, xxv. 99 (1923).

Bolle, l. c. 71, points out that *Geum virginianum* L. was based on the very distinct southern species which has been known as *G. flavum* (Porter) Bicknell, Bull. Torr. Bot. Cl. xxiii. 523 (1896), a species which has the geographic advantage of occurring in Virginia, whereas the species which has been erroneously passing as *G. virginianum* apparently reaches its southeastern limit in Pennsylvania. In describing *G. virginianum* Linnaeus cited references from his earlier *Hortus Cliffortianus* and from Gronovius and Hermann, and, most fortunately, gave a new diagnosis based upon the material before him. The only specimen in the Linnean Herbarium definitely marked by Linnaeus "H. U. [Hortus Upsaliensis] *virginianum*," the specimen which must stand as the type, is shown in plate 368, made from a photograph supplied by Mr. S. Savage, Assistant Secretary of the

Photo. E. C. Ogden.

Geum aleppicum: fig. 2, portion of fruiting head, showing villous achenes, × 4, from Slovakia; fig. 3, achene, × 10, from East Prussia.

G. aleppicum, var. strictum: fig. 1, small fruiting plant, × 1, from Vermont; fig. 4, portion of fruiting head, showing sparsely pubescent achenes, × 4, from Nova Scotia; fig. 5, achene, × 10, from New Hampshire.

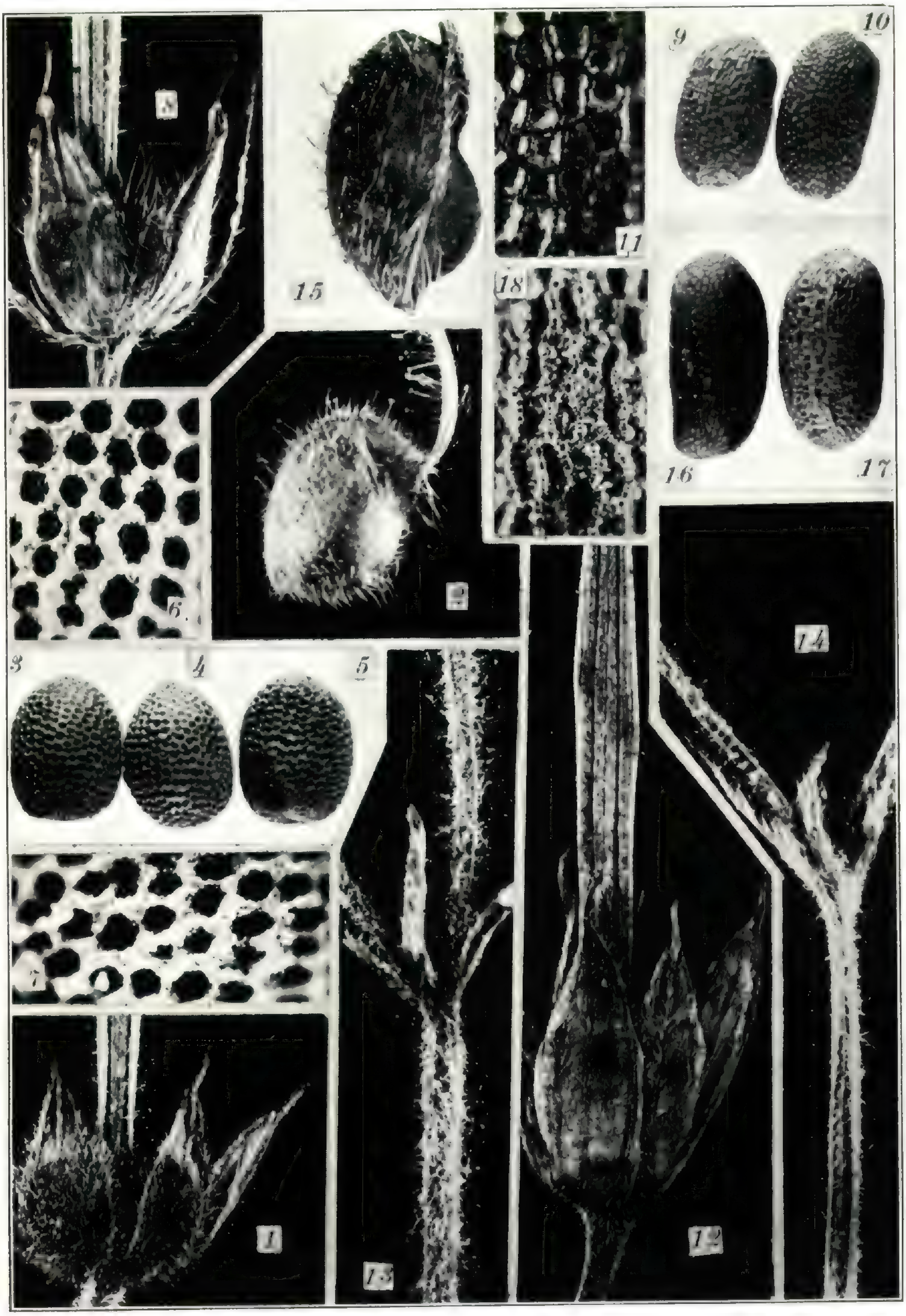


Photo. E. C. Ogden.

GERANIUM DISSECTUM: FIG. 1, calyx, × 5, of *G. laxum;* FIG. 2, carpel-body, × 5; FIG. 3, seed, × 10, from Ireland; FIG. 4, seed, × 10, from Oregon (*G. laxum*); FIG. 5, seed, × 10, from North Carolina; FIG. 6, surface of seed, × 50, from Ireland; FIG. 7, surface of seed, × 50, of *G. laxum.*

G. BICKNELLII: FIG. 8, calyx, × 5; FIGS. 9 and 10, seeds, × 10; FIG. 11, surface of seed, × 50.

G. BICKNELLII, var. LONGIPES: FIG. 12, calyx, × 5; FIG. 13, peduncle and pedicel, × 10, from TYPE; FIG. 14, peduncle and pedicel, × 10, from ISOTYPE of *G. nemorale;* FIG. 10, carpel-body, × 5; FIG. 16, seed, × 10; FIG. 17, seed, × 10; FIG. 18, surface of seed, × 50.

Linnean Society of London. A second sheet, quite different from the first but pinned to it, was not marked by Linnaeus and, therefore, is not specially significant. The only plate cited by Linnaeus under *G. virginianum* (Hermann, Paradisus Batavus, t. 25), although much conventionalized, is not at all inconsistent with the type specimen, either in its characteristic foliage or in its elongate and lax branching. Gronovius gave no original diagnosis, merely copying that of Linnaeus in *Hortus Cliffortianus* and also the reference to Hermann which was also given by Linnaeus.

Since *Geum virginianum* proves to be quite distinct from the coarser and hirsute plant of broader continental range which we have been calling "G. virginianum," we must seek a name for the latter. The earliest name available seems to be G. LACINIATUM Murr., taken up by Bolle. Murray's plant, upon which I based *G. virginianum*, var. *Murrayanum*, has quite glabrous carpels and is generally of more northern range than the bristly-fruited plant which, in 1923, I mistook for typical *G. virginianum*. The latter should be called

G. LACINIATUM Murr., var. **trichocarpum**, var. nov., carpellis supra setosis.—TYPE: swampy woods, Franklin, Connecticut, August 22, 1914, *R. W. Woodward* in Gray Herb.

The variety occurs from Nova Scotia to Ontario (swale at base of gneiss hill, Markstay, Sudbury Distr., no. 3386), south to Pennsylvania and Missouri.

The common North American plant which with us is passing as *Geum strictum* Ait. Hort. Kew. i. 217 (1789) is so nearly identical with the Eurasian *G. aleppicum* Jacq. Ic. Pl. Rar. i. t. 93 (1781–1786) and Coll. i. 88 (1786) that the two, along with some others which often pass as local species, apparently represent one circumboreal and variable specific type. In Europe, recent authors (Ascherson & Graebner, Domin, Bolle) have been reducing the North American (and eastern Asiatic) *G. strictum* Ait. without qualification to *G. aleppicum*. Dr. Eric Hultén, however, maintains *G. strictum* tentatively, saying "The picture given by JACQUIN [our PLATE 369] shows a plant with radical leaves having large rounded slightly lobated terminal leaflet, and several European specimens of the corresponding plant also have similar large basal leaves. Our plant [*G. strictum*] usually has a three-cleft acutely serrated terminal leaflet on the radical leaves, but sometimes leaves occur resembling that illustrated by JACQUIN. They are then small and wither early. As our plant is apparently not quite identical with the European, I prefer to name it

as above, which is in any case correct. The difference between the two plants is certainly not great and after a close study of a large amount of material from Europe, Asia and America it may perhaps prove most rational to unite them under the older name *G. Aleppicum*."[1]

The difference in basal leaves brought out by Hultén is a character of rather negative value. As he says, typical *Geum aleppicum* (PLATE 369) has the basal leaves with large rounded terminal leaflet, while *G. strictum* often lacks this rounded terminal leaflet but usually has some or all of the radical leaves with more acutely and deeply dissected terminal leaflet. In the large series of North American material before me this character is highly variable. Of the sheets which properly display the radical leaves 75 lack the broad and rounded type which characterizes typical *G. aleppicum* of Eurasia, but 82 have such leaves, some specimens quite lacking the more dissected basal foliage. An average, small North American plant, × 2/5, is shown in PLATE 370, FIG. 1.

After studying typical *Geum aleppicum* from various stations in Armenia, Slovakia, Galicia and Prussia I find one difference which seems to separate true *G. aleppicum* from *G. strictum*. In the former the body of the achene (FIGS. 2 and 3) is long-villous, in the latter (FIGS. 4 and 5) it is smooth except on the margin and summit or only short-pilose. Although the two are apparently conspecific it will make for clarity to recognize the wide-ranging North American and eastern Asiatic plant as

G. ALEPPICUM, var. **strictum** (Ait.), comb. nov. *G. strictum* Ait. Hort. Kew. ii. 217 (1789), as to North American plant described, but excluding synonym *G. aleppicum*. PLATE 370, FIGS. 1, 4 and 5.

PLATE 370 shows a characteristic small plant of *Geum aleppicum*, var. *strictum* (FIG. 1) from Vermont (*E. F. Williams*). FIG. 2 shows a fruiting head, × 2, of typical *G. aleppicum* from Slovakia (*Domin & Krajina*, Fl. Čechoslov. Exsicc., no. 272); FIG. 3, a typical achene, × 10, of *G. aleppicum* from Prussia (*C. Sania*). FIG. 4 is a typical fruiting head, × 2, of var. *strictum* from New Hampshire; FIG. 5 a mature achene, × 10, from New Hampshire.

G. MACROPHYLLUM Willd. MICHIGAN: near Sault Ste. Marie, August 14, 1910, *J. R. Churchill* in Gray Herb.

In his map of the North American range of *Geum macrophyllum*, RHODORA, xxxiii. 175 (1931), Dr. H. M. Raup indicated the occurrence

[1] Hultén, Fl. Kamtch. iii. 77 (1929).

of the species on the Lower Peninsula. Judge Churchill's material is quite typical of *G. macrophyllum.*

G. MACROPHYLLUM, var. PERINCISUM (Rydb.) Raup, RHODORA, xxxiii. 176 (1931). *G. perincisum* Rydb. N. Am. Fl. xxii. 405 (1913). MICHIGAN: in slashings, Turin, Marquette Co., June 24, 1901, *Bronson Barlow* in Gray Herb.

Rydberg included Michigan in his statement of range, and Raup has a dot on the Upper Peninsula, as the extreme eastern limit on his map. The Barlow specimen is here cited that the record may be more definitely localized; the Barlow plant is of the most extreme development of the variety, having both basal and cauline leaves sharply incised.

G. TRIFLORUM Pursh. ONTARIO: savannahs, swales and peaty depressions in the limestone pavement, Great Cloche Island, no. 3387.

Macoun's records and all specimens in the Canadian National Herbarium and the herbarium of the University of Toronto are from southern Ontario.

DRYAS DRUMMONDII Richardson. ONTARIO: on dry cliffs, south side of North Slate Island, Thunder Bay District, *Pease & Bean,* no. 23,629.

The Slate Islands are the only known locality for this characteristic species between the Rocky Mountains and the Gaspé Peninsula (see p. 197). Already reported by Macoun as collected there by Prof. Ellis. The Pease & Bean collection consists of a single typical specimen.

GERANIUM CAROLINIANUM AND ALLIES OF NORTHEASTERN NORTH AMERICA (PLATES 371–374).—In the limestone gravel of Great Cloche Island we collected a plant, there abundant, which looked so unlike either *Geranium carolinianum* or *G. Bicknellii,* the two native small-flowered species conventionally recognized in the general area, that its identification has led to a somewhat extended study of the small-flowered Geraniums occurring in northeastern North America. This study has brought to light some reliable diagnostic characters not heretofore emphasized and it has shown that some of our plants have been passing under erroneous or quite unnecessary names. I am, therefore, here presenting a key to the species involved, with fuller discussion of some of the more critical plants. My grouping of the members of true *Geranium* (excluding *G. Robertianum* from the present discussion) is as follows.

a. Petals 1.4–2.3 cm. long, 0.7–1.3 cm. broad, much exceeding calyx; terminal beak of mature style-column 5–10 mm. long; anthers 2–3 mm. long; perennials with thick crowns and stout rhizomes (*G. maculatum* L., *G. pratense* L. and the casual garden-escapes, *G. ibericum* Cav. and *G. sanguineum* L.).

a. Petals smaller, shorter than to exceeding calyx; beak of mature style-column 0–6 mm. long; anthers 0.5–0.8 mm. long; annuals or biennials (nos. 1 and 7 perennial) with tap-roots. . . . *b.*

b. Sepals prominently awned or subulate-tipped, the tips 0.7–3 mm. long; seeds with reticulate surfaces. . . . *c.*

c. Peduncles all 1-flowered or terminated by 1 pedicel . . . 1. *G. sibiricum.*

c. Peduncles all or nearly all with 2 pedicels; inflorescences 2–∝-flowered. . . . *d.*

d. Fruiting pedicels much longer than calyx; beak of mature style-column 2.5–6 mm. long.

Pedicels with minute appressed glandless pubescence; carpel-bodies glabrous . . . . 2. *G. columbinum.*

Pedicels densely glandular-pilose; carpel-bodies hairy . . . . 3. *G. Bicknellii.*

d. Fruiting pedicels shorter than to slightly longer than calyx; beak of mature style-column 1–2 mm. long. . . . *e.*

e. Carpel-bodies short-hirsute with horizontally spreading hairs; lobes of middle and upper leaves acute; seed strongly reticulate or pitted, with subuniform square or rounded unequally thick-walled pits . 4. *G. dissectum.*

e. Carpel-bodies long-villous with ascending hairs; leaf-lobes obtuse; seeds loosely reticulate with irregular elongate thin-walled areolae or obscurely and subuniformly reticulate.

Larger mature sepals broadly ovate, 5–8 mm. wide, 5-nerved; seed subspherical, 2–2.7 mm. in diameter, faintly reticulate with about 50 rows of small square to rounded areolae. . . . . . . 5. *G. sphaerospermum.*

Larger mature sepals 3–4.5 mm. wide, 3-nerved; seeds oblong, 1–1.5 mm. thick, with 20–35 irregular rows of loosely elongate areolae . . 6. *G. carolinianum.*

b. Sepals awnless, at most with minute callous tips; seeds smooth or only minutely granular. . . . *f.*

f. Carpel-bodies not cross-wrinkled, finely pubescent; style-column beakless.

Sepals 5–8 mm. long; petals twice as long, deeply notched; carpel-bodies 3–3.5 mm. long, puberulent; fruiting style-column 1.1–1.5 cm. long . . . . 7. *G. pyrenaicum.*

Sepals 2.5–4 mm. long; petals about as long, shallowly notched; carpel-bodies 2 mm. long, strigose; fruiting style-column 6–9 mm. long . . . . 8. *G. pusillum.*

f. Carpel-bodies conspicuously cross-wrinkled, glabrous; style-column terminated by a filiform beak 1–2 mm. long . . . . 9. *G. molle.*

1. G. SIBIRICUM L. Sp. Pl. i. 683 (1753).—Locally naturalized from Eurasia: New York and Pennsylvania to Illinois.

2. G. COLUMBINUM L. Sp. Pl. i. 682 (1753).—Locally naturalized from Europe: New York and Ohio, south to Virginia and West Virginia; South Dakota.

3. G. BICKNELLII Britton. Hairs of upper internodes unequal, some long, others short and sometimes gland-tipped; peduncles and pedicels loosely hirsute and with shorter often glandular hairs inter-

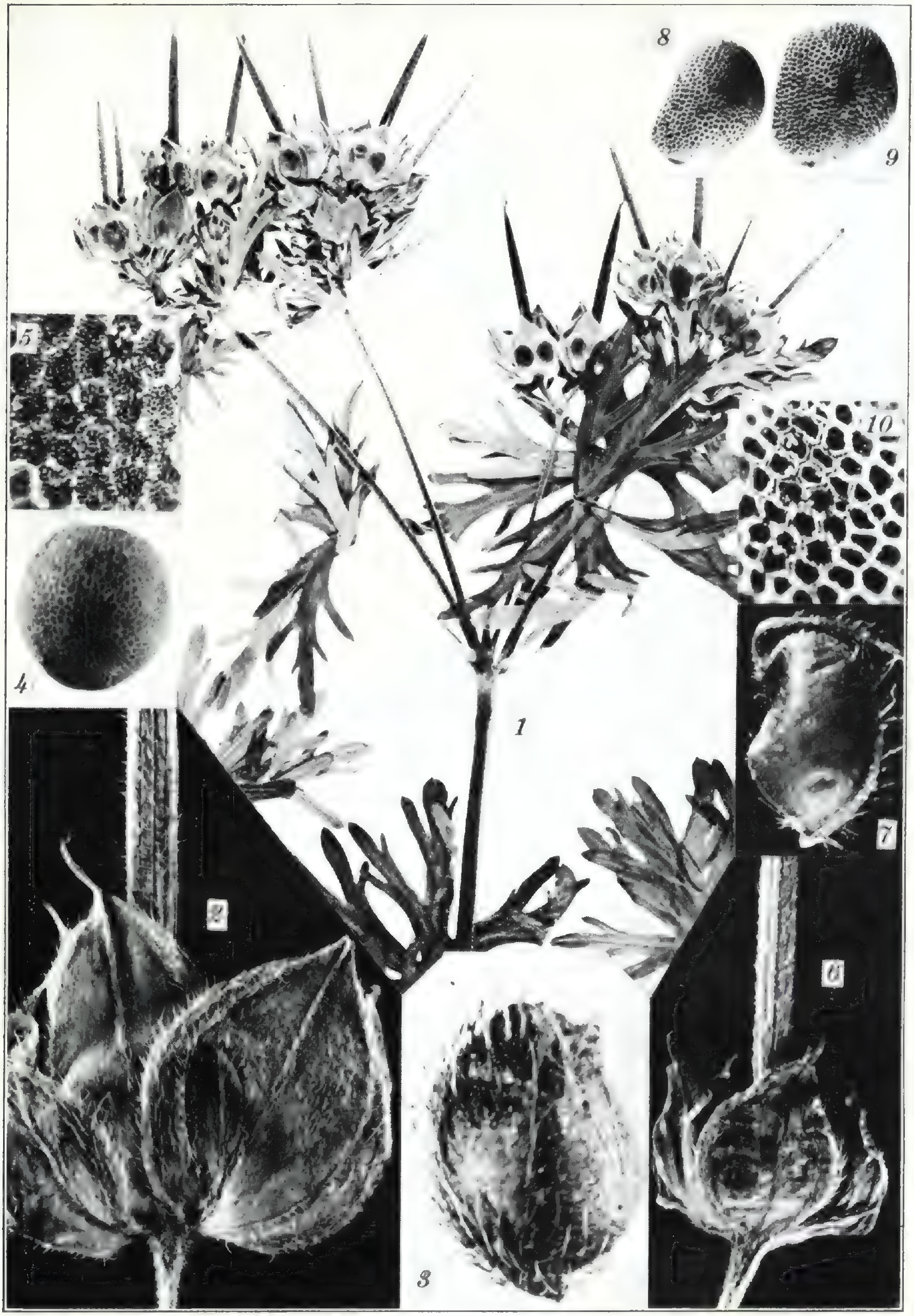
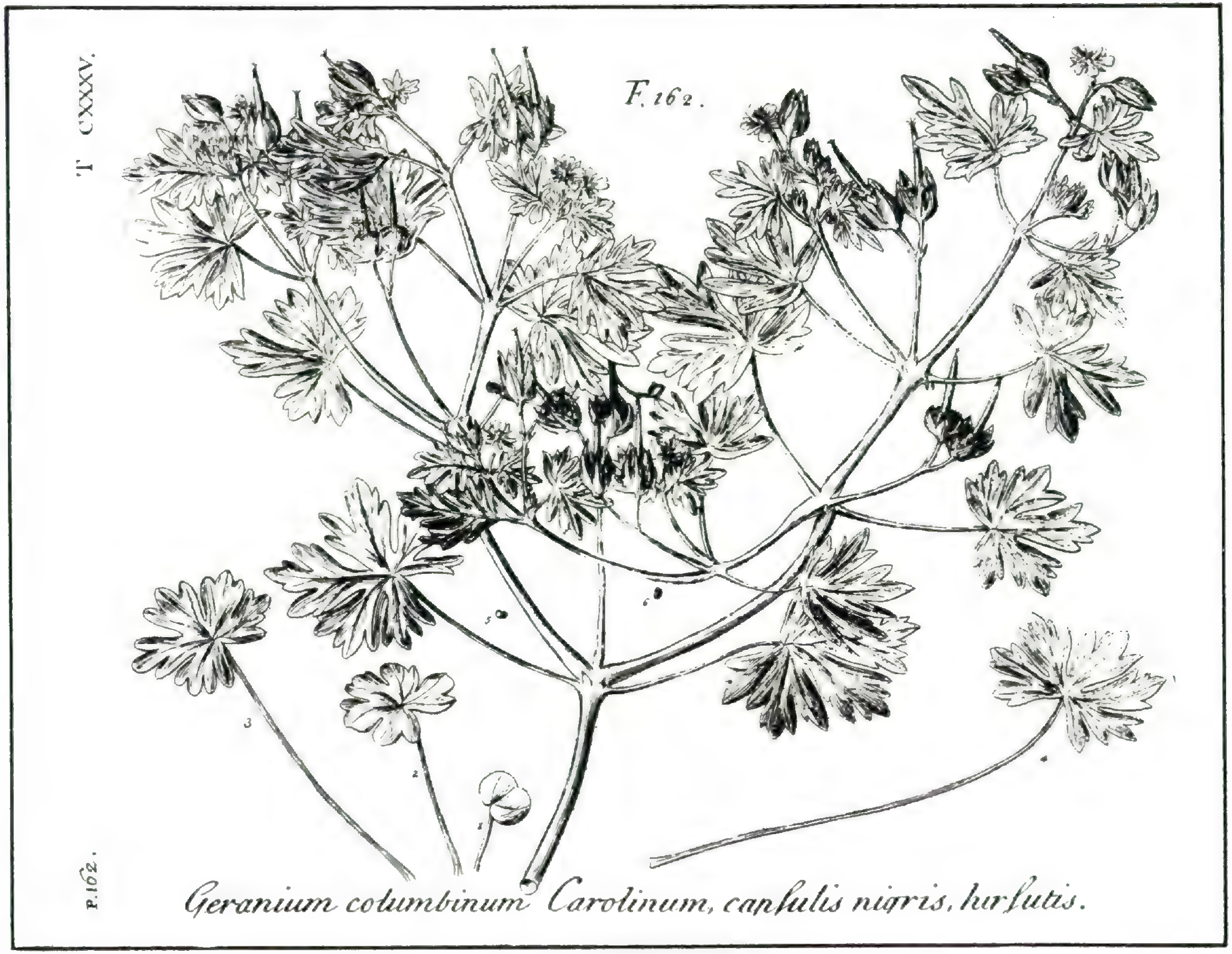


Photo. E. C. Ogden.

GERANIUM SPHAEROSPERMUM: FIG. 1, portion of fruiting plant (TYPE), × 1; FIG. 2, calyx, × 5; FIG. 3, carpel-body, × 10; FIG. 4, seed, × 10; FIG. 5, surface of seed, × 50.
G. TEXANUM: FIG. 6, calyx, × 5; FIG. 7, carpel-body, × 10; FIGS. 8 and 9, seeds, × 10; FIG. 10, surface of seed, × 50.



GERANIUM CAROLINIANUM

mixed; calyx unequally ciliate-hirsute on margin and nerves.—Bull. Torr. Bot. Cl. xxiv. 92 (1897).—Open woods, clearings and disturbed soil, Newfoundland to Alberta, south to Nova Scotia, Massachusetts, western Connecticut, New York, northern Indiana and Iowa. PLATE 371, FIGS. 8–11.

Var. **longipes** (Wats.), comb. nov. Pubescence of upper internodes, peduncles and pedicels more uniform, short and gland-tipped; sepals with shorter gland-tipped ciliation; seeds slightly larger. *G. carolinianum*, var. *longipes* Wats. Bot. King's Expl. 50 (1871). *G. nemorale* Suksd. Deuts. Bot. Monats. xvi. 222 (1892). *G. longipes* (Wats.) Goodding, Bot. Gaz. xxxvii. 56 (1904).—Western Ontario, northern Michigan and Minnesota; Saskatchewan to British Columbia, south to Colorado, Utah and northern California. PLATE 371, FIGS. 12–18.

The western material of *Geranium Bicknellii* seems to be mostly a consistent series, characterized by the comparatively short and nearly uniform mostly glandular pubescence of the upper half of the plant. About the Great Lakes both extremes and numerous transitions occur and I can find no essential differences (except a slight one of size) of seeds between the typical eastern *G. Bicknellii* (FIGS. 9–11) and typical western var. *longipes* (FIGS. 16–18), although there are individual variations in the walls of the alveolae. Though Hanks and Small, N. Am. Fl. xxv. 4–10 (1907) reduce *G. carolinianum* var. *longipes* and the resultant *G. longipes* without question to eastern *G. Bicknellii*, they maintain *G. nemorale* as a distinct species, *G. Bicknellii* described with "peduncles glandular-villous," *G. nemorale* separated by "peduncles retrorsely pubescent." A portion of a peduncle from the TYPE (*Watson*, no. 206) of *G. carolinianum* var. *longipes* is shown in FIG. 13, × 10, one from an ISOTYPE (*Suksdorf*, no. 2028) of *G. nemorale* in FIG. 14, also × 10; I see no specific nor other characters to separate them.

4. G. DISSECTUM L. Cent. Pl. i. 21 (1755). *G. laxum* Hanks in N. Am. Fl. xxv. 9 (1907).—Somewhat adventive in the Eastern States; generally naturalized from Europe on the Pacific slope. PLATE 371, FIGS. 1–7.

Although the common plant of the Pacific slope has generally been recognized as an early and rapidly spreading introduction from Europe, Hanks & Small treat it as an endemic American species "resembling *G. dissectum*." In their key *G. dissectum* is assigned "Seeds pitted" as contrasted with *G. laxum* with "Seeds reticulate"; *G. dissectum* with "carpel-bodies pubescent with minute spreading hairs," *G. laxum* with them "glandular-pubescent." In the fuller

diagnoses, however, we find under *G. dissectum* "carpel-bodies 2–2.5 mm. long, glandular-pubescent," while *G. laxum* (which in the key had them "glandular-pubescent") in the diagnosis has "carpel-bodies 2–2.5 mm. long, hirsute." The difference is not clear, unless it is to be found in the "pitted" seed of *G. dissectum*, the "reticulate" seed of *G. laxum*. Dr. Gleason has most kindly lent me the type and a number of authentic sheets of *G. laxum*. They are of the characteristic western American introduced plant. Seeds from *G. laxum* of western North America, × 10, and their markings, × 50, are shown in PLATES 371, FIGS. 4 and 7, similar enlargements of seeds of European *G. dissectum* and of the weed introduced in eastern America are shown in FIGS. 3, 5 and 6. No essential difference is apparent.

5. G. **sphaerospermum** sp. nov. (TAB. 372, FIGS. 1–5). Annuum vel bienne, *G. carolinianum* simulans; caulibus simplicibus vel ramosis ramis adscendentibus, 1–4.5 dm. altis minute retrorseque albido-pilosis; foliis reniformi-orbiculatis 2–7 cm. latis profunde 5-partitis, segmentis apice lobatis lobis obtusis; inflorescentiis terminalibus confertis umbelliformi-corymbosis; pedunculis pedicellisque minute retrorso-pilosis valde abbreviatis; sepalis late ovatis manifeste mucronatis accrescentibus maturis 5–8 mm. latis 5-nerviis, nervis margineque piloso-hirsutis; petalis roseis sepalis subaequantibus; columnis stylorum maturorum 1–1.5 cm. longis piloso-hirsutis, apice rostratis, rostro subulato 1–1.5 mm. longo; valvulis longe villosis, villis adpresso-adscendentibus; seminibus subsphaericis 2–2.7 mm. diametro obsolete reticulatis, areolis ca. 50-seriatis quadratis vel rotundatis.—Limestone gravel and rich clearings, Ontario to Washington, south to northern New York, South Dakota, Montana and northern California. The following have been examined. ONTARIO: sur les calcaires du Lac Constance, South March, 4 juillet 1922, *Victorin*, no. 15,912; Whitby, August 13, 1915, *L. V. Baker* (herb. Univ. Toronto); savannahs, swales and peaty depressions in the limestone pavement, Great Cloche Island, June 29, 1934, *Fernald & Pease*, no. 3405 (TYPE in Gray Herb.). NEW YORK: rocky banks (calcareous), Black River below Watertown, June 27, 1922, *House*, no. 8925 in part (mixed with and distributed as *G. Bicknellii*). SOUTH DAKOTA: Whitewood, alt. 4500 ft., Black Hills, July 7, 1892, *Rydberg*, no. 585; near Old Fair Grounds, Limestone, Black Hills, July 6, 1909, *J. Murdoch, jr.*, no. 3532; moist ravines, Deadwood, July 19, 1913, *Carr*, no. 67. SASKATCHEWAN: wheat-field west of Yorktown, July 7, 1906, *Herriot* in Herb. Geol. Surv. Can., no. 70,864; Thomas Lake, August 19, 1906, *Herriot* in Herb. Geol. Surv. Can., no. 70,864. MONTANA: Seely Lake (near Knopp place), August 6, 1924, *Kirkwood*, no. 1837; Bozeman, September 5, 1901, *W. W. Jones*. WASHINGTON: Clark Springs, Spokane, July 10, 1902, *Kreager*, no. 132. CALIFORNIA: Berry Cañon, Butte Co., May 8, 1902, *Heller* (apparently belongs here, too young

for final identification). All, unless noted, distributed as *G. carolinianum.*

Geranium sphaerospermum is at once separated from *G. carolinianum* (PLATES 373 and 374) by its very broad and 5-nerved sepals, its essential lack of glandularity and by the entirely different seed, *G. carolinianum* having elongate seeds with a loose reticulation of elongate areolae (PLATE 374, FIGS. 3–5, 7 and 8). Whereas *G. carolinianum* is of broad range across the southern United States, barely reaching north into southernmost Canada and occurring in sterile, circumneutral to acid sands and gravels, *G. sphaerospermum* is a Canadian calcicolous species. At its type locality, on Great Cloche Island, it was associated with a notable and characteristic group of calcicoles: *Equisetum variegatum, Bromus Kalmii, Agropyron trachycaulum, Eleocharis compressa* and *pauciflora* var. *Fernaldii, Carex sterilis, C. scirpoidea* var. *convoluta, C. vaginata, C. eburnea, C. concinna, C. Crawei, C. capillaris, Juncus alpinus* var. *rariflorus, Tofieldia glutinosa, Arenaria stricta, Ranunculus fascicularis, Geum triflorum,* etc. Similarly, the ledges of the Black River, where House got *G. sphaerospermum,* have long been famous for their localized northern calcicoles; it was there or near-by that Crawe, nearly a century ago got *Geum triflorum,* the first and last collection in New York State.

In its subspherical seed with abundant, subuniform, small alveolae, *Geranium sphaerospermum* suggests *G. dissectum* (PLATE 371, FIGS. 1–7) and *G. texanum* (Trel.) Heller (PLATE 372, FIGS. 6–10). Both these species have very small sepals as compared with *G. sphaerospermum* and their seeds are very prominently pitted or reticulate, the alveolae of the newly proposed species barely discernable. In outline of the sepal and its tendency to 5 nerves *G. texanum,* endemic in southern Texas and adjacent Mexico, so far as is known, is the nearest approach to *G. sphaerospermum.* Besides by its small and glabrous (except on the nerves) sepals (FIG. 6) and sharply reticulate seeds (FIGS 8–10) *G. texanum* is characterized by its solitary peduncles scattered in the forks of the stem and by the almost glabrous surface of the carpel-body (FIG. 7). Both *G. texanum* of southern Texas and *G. sphaerospermum* of southern Canada and the northern States are very remote in their characters from *G. carolinianum,* with which they have both been confused.

6. G. CAROLINIANUM L. Internodes, petioles, peduncles and pedicels densely retrorse-hirsute with subuniform hairs mostly less than 0.5 mm. long mixed (on pedicels) with short glands; peduncles solitary in the upper forks or loosely aggregated in 4–12-flowered terminal

corymbs.—Sp. Pl. 682 (1753). *G. atrum* Moench, Meth. 285 (1794). *G. lanuginosum* Jacq. Hort. Schoenb. ii. 8 (1797). *G. Langloisii* Greene, Pittonia iii. 171 (1897).—Dry rocky woods, fields and waste places, Florida to southern California, north to Massachusetts, Connecticut, West Virginia, southern Michigan, Illinois, Missouri, Kansas, Wyoming, Idaho and southern British Columbia. Plate 373, and 374, figs. 7 and 8.

Var. **confertiflorum**, var. nov. (tab. 374, figs. 1–6), laxe villoso-hirsutis pilis plerumque 1 mm. longis; inflorescentiis terminalibus confertis umbelliformi-corymbosis 5–25-floris.—Dry rocky or sandy soil, southern Maine to Wisconsin, south to Delaware, uplands of North Carolina and Tennessee, and Missouri. Type: open field, North Amherst, Lorain Co., Ohio, June 22, 1924, *R. J. Webb*, no. 5263 in Gray Herb.

Var. *confertiflorum*, the northeastern extreme of the species, has been passing as typical *Geranium carolinianum*. It is not represented in the Gray Herbarium from either of the Carolinas except from the mountains of North Carolina. It was obviously this northern plant which Greene visualized as *G. carolinianum* when he segregated as a distinct species *G. Langloisii*, the common southern extreme, "canescent with white hairs, these deflexed on the stem, . . . gland-tipped hairs wholly wanting, but the inflorescence minutely glandular . . . distributed as *G. Carolinianum;* but that species has a different mode of growth, a gland-tipped and viscid spreading pubescence," etc. Similarly in the North American Flora, Hanks & Small separate the two in their key as follows:

Inflorescence open, few-flowered . . . . 8. *G. Langloisii.*
Inflorescence compact, many-flowered . . . . 9. *G. carolinianum.*

Geranium carolinianum of Linnaeus was thus defined:

carolinianum. 34. GERANIUM pedunculis bifloris, calycibus aristatis, foliis multifidis, pericarpiis hirsutis. *Roy. lugdb.* 351. *Gron. virg.* 78
Geranium columbinum carolinum, capsulis nigris hirsutis. *Dill. elth.* 162. *t.* 135. *f.* 162.
Habitat in Carolina, Virginia. ⊙.

Royen simply referred to the Dillenian description and plate cited by Linnaeus, as did Gronovius who, however, cited a Clayton specimen (no. 372). The Dillenian *Geranium columbinum carolinum* from which the specific name and first locality, Carolina, were obviously derived by Linnaeus, was well and fully described and clearly illustrated. The plate of Dillenius, slightly reduced is here reproduced as our plate 373. That it is the southern plant described as *G. Langloisii*, with "Inflorescence open, few-flowered" rather than the more north-

Photo. E. C. Ogden.

Geranium carolinianum, var. confertiflorum: fig. 1, portion of fruiting plant (type), × 1; fig. 6, calyx, × 5; fig. 2, carpel-body, × 10; figs. 3 and 4, seeds, × 10; fig. 5, surface of seed, × 50.
G. carolinianum: fig. 7, seed, × 10; fig. 8, surface of seed, × 50.

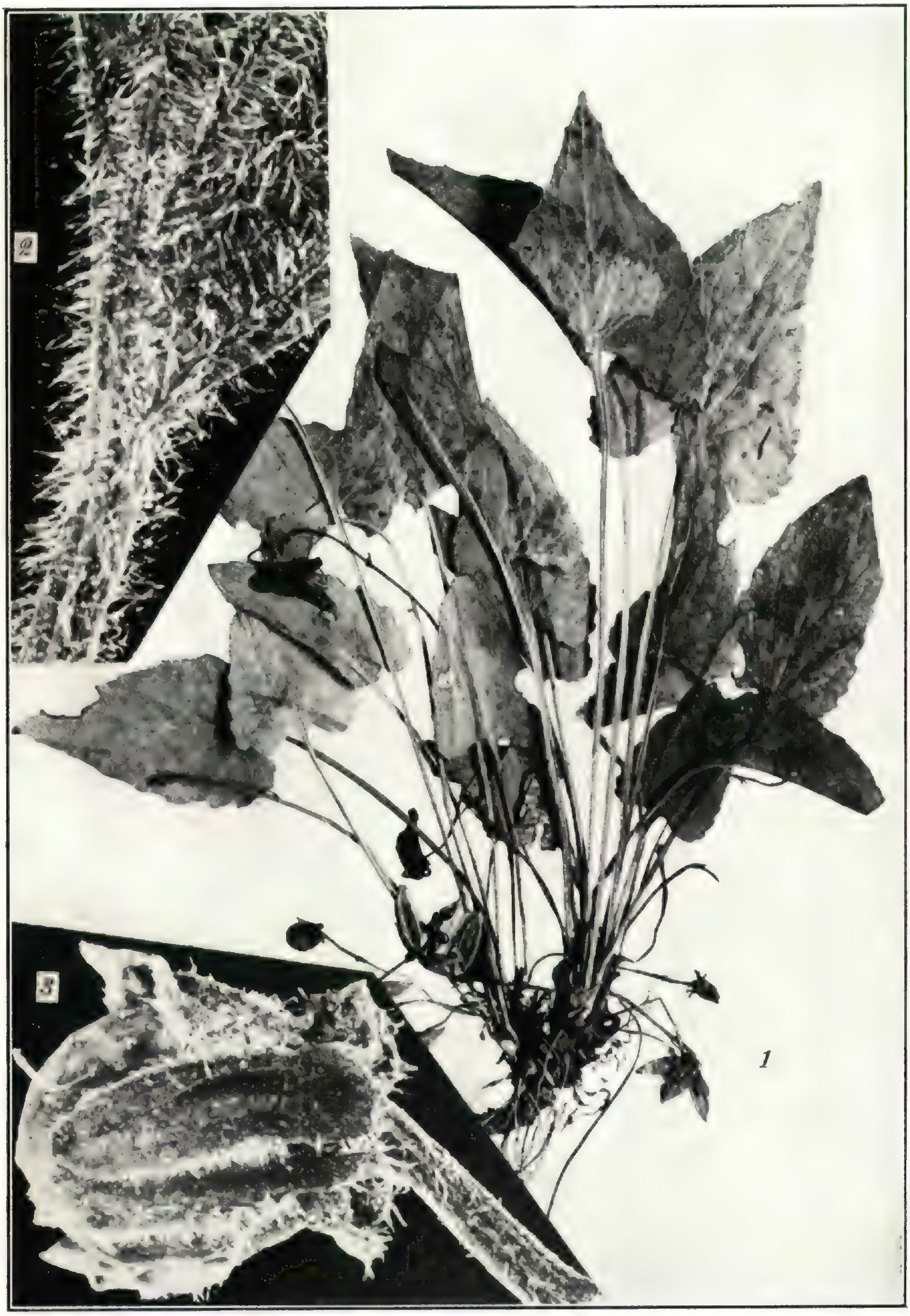


Photo. E. C. Ogden.

Viola septentrionalis, var. grisea: fig. 1, fruiting plant (type), × 1; fig. 2, base of expanding leaf, × 10; fig. 3, cleistogamous fruit, showing ciliate sepal-auricles, × 10.

eastern plant with "Inflorescence compact, many-flowered" (var. *confertiflorum*) is evident.

7. G. PYRENAICUM Burm. f. Sp. Geran. 27 (1759). Adventive from Europe: roadside-ditches near Quebec and very locally elsewhere.

8. G. PUSILLUM Burm. f. l. c. (1759). Naturalized from Europe: Massachusetts to southern British Columbia and southward.

9. G. MOLLE L. Sp. Pl. 682 (1753). Adventive from Europe: chiefly in lawns and grass-land, Nova Scotia to British Columbia and southward.

CEANOTHUS OVATUS Desf., var. PUBESCENS T. & G. MICHIGAN: wind-swept crests, crevices and talus of sandstone-conglomerate, West Bluff, Keweenaw Co., no. 3414; sandy barrens west of Norway, Dickinson Co., no. 3415.

The glabrous, typical *Ceanothus ovatus* is well represented from Michigan; I find no records for var. *pubescens*.

C. SANGUINEUS Pursh. MICHIGAN: wind-swept crests, crevices and talus of sandstone-conglomerate, West Bluff, Keweenaw Co., no. 3416; dry, deciduous woods at base of greenstone and calcareous conglomerate bluffs, east of Eagle Harbor, no. 3,417 (shrubs up to 3 m. high).

Recorded from the same general area (Copper Harbor) by Farwell, RHODORA, xvii. 230 (1915). Otherwise very local east of the Pacific Slope. See p. 209 and MAP 6.

VIOLA SEPTENTRIONALIS Greene, var. **grisea**, var. nov. (TAB. 375), foliis lanceolato-deltoideis vel anguste lanceolato-ovatis utrinque griseo-pilosis.—MICHIGAN: dry sandy plain near Driggs, Schoolcraft Co., July 2, 1934, *Fernald & Pease*, no. 3430 (TYPE in Gray Herb.).

Superficially *Viola septentrionalis*, var. *grisea* is so similar to *V. novae-angliae* House that, without close examination, it could readily pass as that species. It has, however, the characteristic capsule and strongly ciliate sepal-auricles (FIG. 3) and the seeds of *V. septentrionalis* and gray pilosity such as is not found in *V. novae-angliae*. Its pubescence is that of the common eastern *V. septentrionalis* but much denser (FIG. 2), whence the name, and its leaf-blades much narrower than in the characteristic eastern plant.

(*To be continued*)

TILLAEA AQUATICA ON LONG ISLAND.—This little plant of brackish shores has been reported from New York State only from the banks of the Hudson River near Peekskill (House, Bull. N. Y. State Museum

254. 375 (1924)). It was therefore interesting to find it growing on tidal mud in the Carman River near South Haven (*Svenson* no. 6397). —H. K. Svenson, Brooklyn Botanic Garden.

NOTES ON THE NORTHERN RANGE OF ZIZANIA IN MANITOBA

A. I. Hallowell

In the course of an ethnological study of the Saulteaux Indians of the Berens River, conducted during the past three summers, the writer has collected a considerable amount of ethno-botanical data. The river mentioned rises in Ontario, flows northwestward and empties into Lake Winnipeg at approximately 52° 20′ N. Lat. The band of Indians farthest up the river inhabits the neighborhood of Lake Pekangikum (Ont.) some 260 miles from the mouth. A second band, the Grand Rapids group, occupies the district midway between the Pekangikum band and the Berens River band proper, located at the mouth of the river.

Among the other items *Zizania aquatica* L., although not as important today as formerly, is a food plant well known to all of these Indians. This use of *Zizania*, paralleled by many American natives elsewhere, would scarcely be worth recording in a botanical journal were it not for the fact that data obtained on the precise localities where the plant flourishes in abundance, seems to indicate that it grows somewhat farther north than has hitherto been reported in this area. Many years ago, for example, when Prof. A. E. Jenks published his "Wild-Rice Gatherers of the Upper Lakes"[1] he included data obtained from botanists and the botanical literature on the geographical range of *Zizania*. He stated its northern limits to be approximately 50°.[2] Even in the "Check List of Manitoba Flora" issued by the Botany Department of Manitoba Agricultural College, 1922, the only locality specified for *Zizania* is Sturgeon Creek, in the southern part of the Province. Yet until recently the native Indians of various localities east of Lake Winnipeg and almost as far north as 53° have been annually harvesting the plant and utilizing it as one of their staple foods for many years.

My personal interest in the range of *Zizania* grew out of the ques-

[1] Bureau of American Ethnology, 19th Annual Report, 1900.
[2] Op. cit. Part 2, p. 1028.

tion which arose in my mind as to whether the Indians made use of it throughout its limits. Consultation with Dr. J. M. Fogg, Jr. and correspondence with Dr. Hugh M. Raup made it seem worthwhile to record the information I had secured from the Indians, despite the fact that I have not myself observed *Zizania* in all of the localities mentioned below. My principal informant, I might add, was Chief Williams Berens, of the Berens River Band, an exceptionally intelligent Indian, who has travelled widely throughout the country east of Lake Winnipeg, especially between 52° and 54° N. Latitude. According to his observations, *Zizania* does not range as far north as the last mentioned degree, the latitude of Norway House. I visited this locality in 1930 and can testify that the Cree Indians of this district make no use of *Zizania,* a fact which in itself has no botanical value, although it is consistent with Chief Berens' statement. The latter also asserted that no wild rice grows on the canoe route between Norway House and Island Lake to the east, a distance of some 175 miles, at approximately the same latitude. This negative observation is also supported by my own inquiries at Island Lake in 1930, which disclosed no utilization of the grain there by the Saulteau-speaking natives.

Turning now to positive information as to the occurrence of *Zizania,* the following localities are those in which the plant grows in sufficient abundance to have made it worthwhile for the Indians to harvest the grain. Formerly, several of these were visited exclusively for this purpose, although not to-day. In a forthcoming publication I shall indicate these localities on a map. For the purposes of this note, approximate references to degrees of latitude and longitude will have to suffice.

1. In a number of small lakes and creeks on Chief Berens' hunting ground, none of which are named on official maps (Lat. 52° 35′, Long. 96° 30′) *Zizania* grows in abundance. In 1933, he said, there was sufficient wild rice to feed "three or four battalions of men."

2. A lake which, in the native tongue, is known as the "wild-rice gathering place." (Lat. 52° 35′, Long. 96°) is another well-known locality. The Indians of the Poplar River band (north of Berens River) used to frequent this lake for the purpose of harvesting *Zizania* as did members of the Little Grand Rapids band of the Berens River.

3. On the Berens River itself wild rice is fairly abundant from the mouth of the river as far inland as Long Lake (Lat. 52° 10′, Long. 96° 5′), a distance of some 60 miles. Long Lake is likewise the approxi-

mate boundary between the hunting grounds of the Berens River band proper and the Little Grand Rapids Indians.

4. In approximately the same general locality the Etomami River enters the Berens River at Etomami Falls.[1] Above the falls and along the river as far as a fairly large lake *Zizania* grows in abundance. Some of the Grand Rapiders used to gather their wild rice here, since farther up the river it is said to be absent. When I visited Lake Pekangikum in 1932, I found that these Indians did not utilize *Zizania* at all, although they knew its nutritive properties. I was told that it did not grow in sufficient quantities anywhere within their habitat to enable them to exploit it economically. This negative economic fact is reflected by the absence, in their calendrical terminology, of a "wild rice gathering moon" which is to be found in the terminology of the other two bands, as well as among wild rice gatherers of the Great Lakes.

Native place-names, sometimes continued in English translation, are likewise legitimate clues to the occurrence of *Zizania*, because a Wild Rice River or Lake would not be so named by the Indians unless it had reference to the presence, and probably economic exploitation, of the plant in such a locality. I wish, therefore, to call attention to the following localities south of the Berens River which Chief Berens believed to be those exploited by the Indians of the Blood Vein and Hollow Water River bands.

5. Rice River, a small stream which enters Lake Winnipeg from the east at 51° 15′ N. Latitude.

6. Rice Lake (51° Lat., 95° 31′ Long.)

It would appear from this brief survey that, like their Ojibwa cogeners to the southeast, the Saulteaux Indians east of Lake Winnipeg utilized *Zizania* whenever it occurred within their habitat and even made considerable journeys at times to harvest the grain in neighboring localities. While not enlarging the range of *Zizania* in any precise botanical detail the data presented unequivocally indicate that its limits exceed 50° N. Lat. in Manitoba and that there is legitimate doubt whether the plant occurs in any abundance, if at all, beyond 53°.

Department of Anthropology,
University of Pennsylvaniza.

[1] Not to be confused with the junction of the same river and the Berens River much nearer the mouth.

LICHEN FLORA OF THE UNITED STATES.[1] The publication of this long awaited book should fill a serious gap in the botanical literature of the United States. Not since the time of Tuckerman has a work of this scope been attempted, and for the first time adequate keys are provided to the lichen flora of the entire area. The volume was started by Professor Fink along the same lines as his earlier publication, *The Lichens of Minnesota*,[2] and was completed after his death in 1927 by his assistant, Mrs. Joyce Hedrick Jones. Many of the plates are taken from the previous work as is also the introduction which has, however, been brought up to date. In all, 178 genera and 1578 species, varieties, and forms are represented. In the description of species only the diagnostic characters are given, thus eliminating a great deal of the needless repetition of generic characteristics found in the *Lichens of Minnesota*. More space could profitably have been spent on the ranges of species, and some of the ranges stated are open to question as, for example, that of the almost ubiquitous *Evernia prunastri* which is said to occur "from Washington to California." However, even the brief ranges given show very emphatically how much collecting needs to be done before any real knowledge of the distribution of the various species can be arrived at. No mention is made of the distribution of species outside of the United States. The nomenclature follows that of Zahlbruckner with minor changes. Fink's species-concept was much more conservative than that of many lichen investigators and his condensation of *Cladonia* into only 65 species and a few varieties and forms is a most refreshing shelter from the torrential shower of names which threatens to engulf the beginner in this most perplexing genus. The excellence and the modest price of this work should bring numerous new students into the field of lichens and cause a revival of interest in this neglected group.—S. K. HARRIS.

VICTORIN'S FLORE LAURENTIENNE.—It is a most noteworthy event when a country which has never had available proper texts on its own flora, except as prepared "over the line," should in a short space of time have two books by its own sons. The little *Flore-Manuel de la Province de Quebec* by Father Louis-Marie was noted in RHODORA, xxxiv. 19, 20 (1932). Now we heartily welcome the much more extended book[3] on the same area by the senior taxonomist of French Canada. This volume, a sumptuous quarto, is not merely a flora. Its preliminary sections give a very clear physiographic account of the Province of Quebec (in its full extent including much of the Labrador Peninsula) and detailed accounts of the Région Laurentinne, or the terrain drained by the St. Lawrence. Even this area, less than one-third of the Province, is a vast one, and the botanically more interesting eastern half of it (the Gaspé Peninsula, Anticosti, the Côte Nord, the Mingan Islands and the Magdalen Islands) is unfortunately omitted, except in the general phytogeographic discussions—unfortunately, since this area is not already covered by any manual.

[1] BRUCE FINK. *The Lichen Flora of the United States.* 426 + v pp. 47 plates. University of Michigan Press, Ann Arbor, Michigan. 1935.

[2] Cont. U. S. Nat. Herb. xiv, pt. 1. 1910.

[3] FRÈRE MARIE-VICTORIN: *Flore Laurentienne*, illustrée de 22 cartes et de 2800 dessins par FRÈRE ALEXANDRE: 917 pp. Cloth, $5.00; half-leather, $6.50; half-shagreen, with corners and cords, $7.50; postage, .50. De La Salle Press, 949 Côté Street, Montreal, Quebec.

In a brief notice it is impossible to cover all the features of this new book. The brief history of botanical exploration of the region and the phytogeographic discussions will be of great interest to botanists of all eastern North America; and numerous maps illustrating the geological history of the region are conveniently brought together. Since some of the latter are, naturally, chiefly derived from other sources than the author's own studies, it would have helped those who would like to follow up such matters if the slight space necessary had been allowed for reference to the geologists and others from whom these maps were primarily drawn. For those who already know the sources such information is unnecessary, but by most users of the book it would be welcomed.

In the major work the order of families will be unfamiliar to most users, for the system of Wettstein is largely followed. The placing of the Dicotyledons before the Monocotyledons, a procedure now frequent, will cause no special embarassment; but botanists who were brought up on the system of Bentham & Hooker and then that of Engler & Prantl will be disconcerted by certain juxtapositions: the *Euphorbiacea* between the *Caryophyllaceae* and the *Hamamelidaceae;* the *Aristolochiaceae* and the *Sarraceniaceae* in the same order with the *Ranunculaceae;* the *Droseraceae* in the order with the *Violaceae;* the *Empetraceae* in that with the *Ericaceae;* and the wind-pollinated *Typhaceae* treated as the grand evolutionary climax of the Monocotyledons, much higher in development than the tremendously specialized *Orchidaceae.* The lack of finality in the classification of these (and other) groups becomes evident when we note that Hutchinson, in a hypothetical system still later than that of Wettstein, puts the *Euphorbiaceae* 83 families away from the *Caryophyllaceae* and 15 (with the *Leguminosae* in between) from the *Hamamelidaceae;* the *Aristolochiaceae*, the *Sarraceniaceae* and the *Ranunculaceae* in different orders (as in the systems of Bentham & Hooker and of Engler & Prantl), the *Droseraceae* in the *Sarraceniales* (not in the *Violales*), the *Empetraceae* 43 families away from the *Ericaceae,* and the *Typhaceae* 21 families lower in his system than the *Orchidaceae.* In view of the purely hypothetical and largely unsettled phylogeny of many groups and the very different positions assigned them by different theorists, would it not have been advantageous for the users of the *Flore Laurentienne* if the author had followed one of the more generally familiar sequences?

Within the larger families of plants there is great diversity, but careful students of world-wide material have organized the genera into tribes, distinguished by certain fundamental structures. Thus, in the *Compositae,* the tribes, worked out with breadth of knowledge and precision by Bentham, are based on very deep-seated morphological differences; and these tribes have been generally accepted (by Bentham & Hooker, by Engler & Prantl, by Wettstein, and in North America by Gray, Britton and essentially all others). It seems, therefore, a retrograde step to ignore (or perhaps not to have understood) the tribes in a volume meant to reflect a scientific viewpoint. In the *Flore Laurentienne* the genera of *Compositae* (*Tubuliflorae*) are thus grouped (without the tribal designations which are here appended):

Bidens (*Heliantheae*)
Arctium (*Cynareae*)
Centaurea (*Cynareae*)
Tanacetum (*Anthemideae*)
Artemisia (*Anthemideae*)
Antennaria (*Inuleae*)
Anaphalis (*Inuleae*)
Gnaphalium (*Inuleae*)
Petasites (*Senecioneae*)
Erechtites (*Senecioneae*)
Senecio (*Senecioneae*)
Silybum (*Cynareae*)

Cirsium (*Cynareae*)	Achillea (*Anthemideae*)
Eupatorium (*Eupatorieae*)	Anthemis (*Anthemideae*)
Galinsoga (*Heliantheae*)	Rudbeckia (*Heliantheae*)
Heliopsis (*Heliantheae*)	Tussilago (*Senecioneae*)
Helenium (*Helenieae*)	Arnica (*Senecioneae*)
Helianthus (*Heliantheae*)	Inula (*Inuleae*)
Madia (*Heliantheae*)	Solidago (*Astereae*)
Chrysanthemum (*Anthemideae*)	Erigeron (*Astereae*)
Matricaria (*Anthemideae*)	Aster (*Astereae*)

The separation of genera of the *Heliantheae*, the *Cynareae*, the *Anthemideae*, the *Inuleae* and the *Senecioneae* by members of other tribes is a novel feature in a work of scientific pretensions and presumably the result of their chance position in the artificial key.

With the exception of these very striking departures from general sequence, the floristic treatment is conservative and essentially conventional. Only the species (without designation of varieties and forms) are described and practically every one is illustrated in a series of coördinated drawings, reproduced at the tops of many pages. The keys and descriptions are simple but, apparently, adequate; the drawings clear and generally of excellent workmanship. Several of the latter are ingeniously diagrammatic and a number are singularly familiar. The latter are explained in the Préface: "en certains cas on s'est aidé d'illustrations déjà publiées."

Following the Latin names are the French and the English. Many of us have noted the deficient imaginations of Americans of Anglo-Saxon stock, with the resultant poverty of good colloquial names for our plants; but evidently the reputedly more imaginative French Canadian has not yet produced an extensive set of such folk-names. "Claytonie de Caroline," "Montia à graines luisantes," "Aristoloche clématite" and "Ménisperme du Canada" are not indigenous names of the people but literal translations respectively of *Claytonia caroliniana*, Spring Beauty of the English, *Montia lamprosperma*, Water Chickweed or Blinks of the English, *Aristolochia Clematitis*, Birthwort of the English, and *Menispermum canadense*, Moonseed of the English. In some cases, however, good colloquial names are given: Petits Cochon and Herbe-crapaud for *Sarracenia purpurea*, Pruche for *Tsuga canadensis*, Merisier for *Betula lutea*, Bois-sent-bon for *Myrica Gale*, Petards for *Silene Cucubalus*, Gants du Notre-Dame for *Aquilegia*, Savoyane and others for *Coptis groenlandica*, Carcajou for *Dentaria diphylla*, Quatre-temps for *Cornus canadensis* and others equally good; but that such conspicuous plants as our Ground Pine, Cinnamon Fern, Christmas Fern, Sensitive Fern, Ostrich Fern, Blue Cohosh, Squirrel Corn, Black Locust, Indian Pipe, Harebell, Cardinal-flower, Joe-Pye-weed and Pickerel-weed should have no names among the country people of Quebec seems very strange.

Brother Victorin has had the aid of former students in the elaboration of certain groups: *Crataegus* has been very successfully worked out by M. Jules Brunel; the artificial key to families is by M. Jacques Rousseau and so are the treatments of *Viola* and *Astragalus*. But in the main the work is the result of Victorin's own industry and the outcome is one of which he, his countrymen and his friends outside of Canada may be proud.—M. L. F.

Praeger's Botanist in Ireland.—No more readable and elucidating works on floristic botany have been available than the books and articles of Robert Lloyd Praeger. Now the series is continued and enriched by *The Botanist in Ireland*.[1] Beautifully printed and with abundant photographs of characteristic and botanically significant habitats and with many colored and detailed maps, the book sets a standard difficult to excel. The first sentence of the Preface, "Ireland is a pleasant country for the botanist," gives the key-note; and as one peruses the pages and studies the lists of typical species, the pictures and the maps, he is inclined to add, "also an intensely interesting country." In a brief notice details can hardly be given. Geological history, topography, climate and all the physical and chemical features of the region which can have an influence on the flora are well discussed; the specially interesting or rare plants of Ireland (including *Potentilla fruticosa*, *Veronica peregina*, *Utricularia intermedia*, *Sisyrinchium angustifolium*, *Juncus macer* (*J. tenuis* of authors), *Najas flexilis*, *Eriocaulon septangulare*, *Scirpus nanus* and *Rynchospora fusca*) are given particular attention; and the Island and its vegetation is then dissected into small and natural areas under which the local floras are more fully presented. That the flora is not strictly European nor made up only of specialties like those noted above is apparent when it is found that more than 600 of the species are also in our flora of the northeastern United States. Every botanist who is interested in seeing something outside his own local haunts will want the book; then he will want to visit Ireland.—M. L. F.

Listera australis on Long Island.—This small orchid is of wide distribution in the southern states, extending northward to southern New Jersey, and then reappearing in northern New York from Cayuga to St. Lawrence Counties (Metcalf & Griscom, Rhodora xix. 52 (1917)), and is also known from Ottawa, Canada (House, Bull. N. Y. State Mus. **167**. 26 (1913)). Its sole New England station is the one discovered by Mr. Horsford in Vermont (Rhodora xxiv. 187 (1922)). Mr. Edward A. Behr and the writer found a dozen plants of this species flowering in leaf mold in a tupelo and *Liriodendron* swamp at Manorville on May 30, 1931. Specimens are in the Gray Herbarium and the herbarium of the Brooklyn Botanic Garden.—H. K. Svenson, Brooklyn Botanic Garden.

[1] Robert Lloyd Praeger. *The Botanist in Ireland*. 587 + xii pp.; 44 plates, many figs. Dublin. Hodges, Figgis & Co. 12s. 6d.

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Gray Herbarium of Harvard University, Cambridge, Mass.

Photo. E. C. Ogden.

LITHOSPERMUM CROCEUM: FIG. 1, small flowering plant (TYPE), × ½; FIG. 2, fruiting stem, × ½; FIG. 3, back of bract, × 10; FIG. 4, fruiting calyx, × 4; FIG. 5, base of corolla-lobe and summit of tube, × 10.

L. CAROLINIENSE: FIG. 6, back of bract, × 10; FIG. 7, fruiting calyx, × 4; FIG. 8, base of corolla-lobe and summit of tube, × 10.

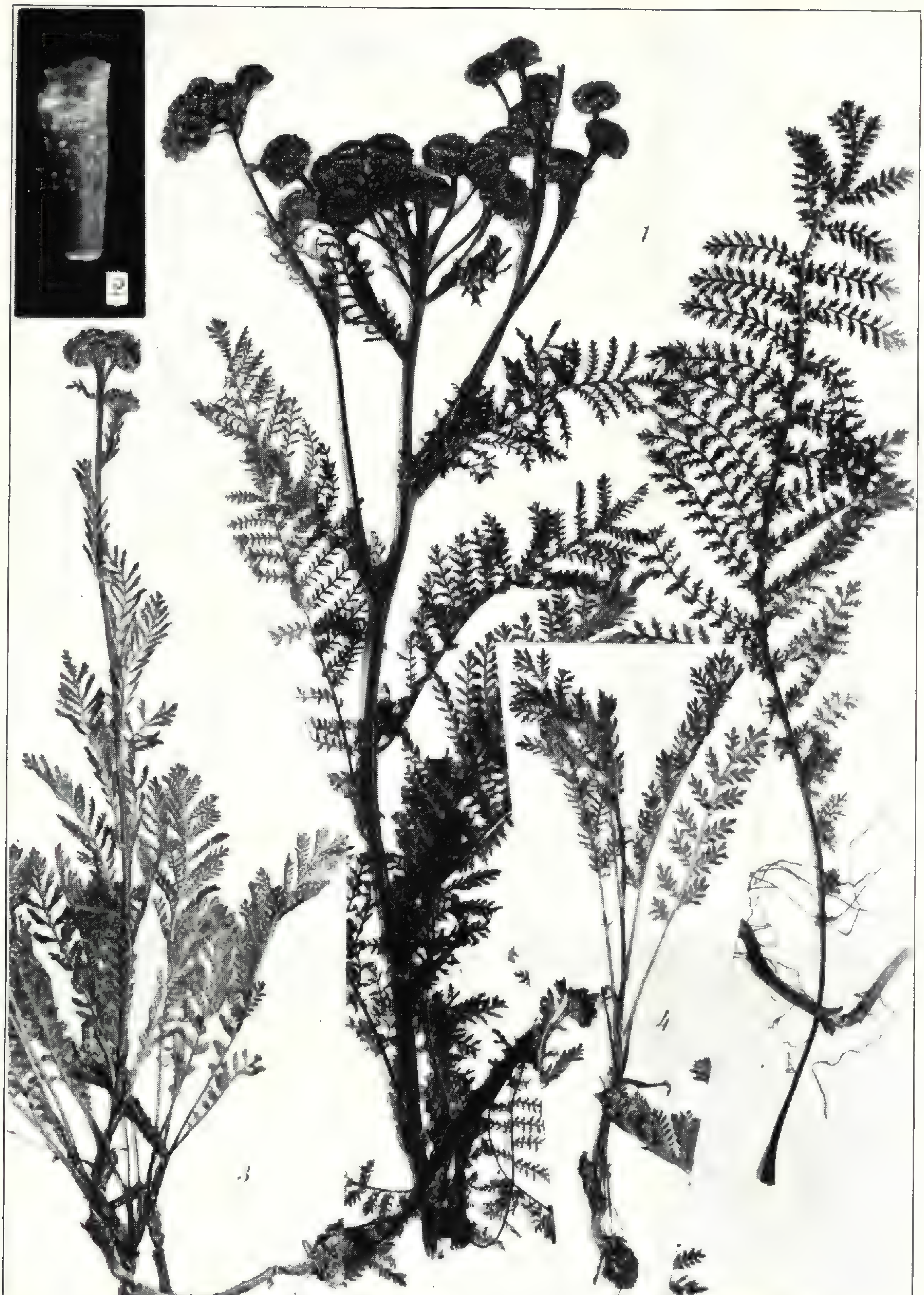

Photo. E. C. Ogden.

TANACETUM HURONENSE, var. TYPICUM: flowering stem and basal leaf, × ⅖, from Michigan; FIG. 2, achene, × 10, from Lake Superior.
T. HURONENSE, var. BIFARIUM: FIGS. 3 and 4, flowering plant and basal rosette, × ⅖, from Anticosti.

Photo. E. C. Ogden.

Tanacetum huronense, var. terrae-novae: figs. 1–3, flowering plants, × ⅖; fig. 4, achene, × 10; all from Newfoundland.

T. huronense, var. johannense: fig. 5, flowering branch, × ⅖; fig. 6, achene, × 10, from New Brunswick.

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NOTES ON SOME PLANTS OF TENNESSEE

H. M. Jennison

This annotated list was begun with the idea of recording plant range extensions based mostly on collections made in recent years. A considerably larger number of entries have been made than was anticipated. In a few cases, part or all of the data presented here, has been published, but in widely scattered papers and books. A goodly part of the paper, however, is devoted to information that is brand new. In all but a very few cases the entries record an extension of range for the plants listed. The notes about *Belamcanda chinensis* (L.) DC., *Conradina verticillata* H.M.J., *Phyllitis Scolopendrium* (L.) Newm., and *Viola renifolia* Gray are notable exceptions.

To be able to tell of two new stations where the rare Sapsuckbush, *Buckleya distichophylla* (Nutt.) Torr., was found growing is something worth noting, as is also the discovery last summer (1933) of Red Spruce, *Picea rubra* (Du Roi) Dietr., in the Shady Valley Swamp, a boreal relic bog in Johnson County, Tennessee, at an elevation of 2800 feet. Several other remarkable finds were made in this Swamp and a detailed report may be expected soon from my colleagues, A. J. Sharp and J. K. Underwood.

Bailey's new (1934) *Rubus tennesseanus*, and two or three less recently described novelties appear in the list. The total number of plant species reported on is 94, of which 10 are Pteridophytes, and 84 are Spermatophytes.

No small number of the entries made are based on data and collections gathered in the summer of 1933 when much of the field work we did was encouraged and sponsored by the Tennessee Valley Authority. Some significant additions were made in 1934. Evidently

there is much left to be learned about the flora of Tennessee in particular, and the southern mountains and valleys in general. Yet it is believed that quite a complete and finished Flora of this region could be brought forth in a few years if adequate support for field surveys and taxonomic studies could be had.

Studied from the point of view of the whole, one is bound to notice additional evidence in support of the theory that the Southern Appalachian mountain region is the place where plant populations of the eastern part of this country were evolved, and the field from which, later, migrating groups took off. We find also supporting evidence of the theory that the southern mountains and valleys were the "reservoir" in which many northern emigrants found a safe harbor and a place to live while the ice sheets made the north country uninhabitable. As is well known, representatives of practically all of the "best families" have remained, and are well established in the mountains of the south.

Furthermore, one notes that an ever increasing number of plants, indigenous to the Coastal Plain and other provinces are being turned up in Tennessee. In all probability, Tennessee was once nearer to a sea coast. If what the geologists tell us in true, we should not be surprised to find Coastal Plain species in western Tennessee. But, may we not be quite thrilled when we find representatives of typical Coastal Plain genera like *Conradina, Orontium, Phyllanthus,* and even *Sarracenia* in remote sections of the Cumberland Plateau?

Also, one finds evidence of the further spread of aggressive immigrants from Europe, such as *Geranium columbinum* L., *Malva moschata* L., *Potentilla recta* L., *Sanguisorba minor* Scop.; and of two oriental Lespedezas.

Lastly one may remark, particularly in the case of the indigens whose range extensions are recorded, that known calcicoles and oxylophytes were found restricted to the soil types of which they are well known inhabitants.

The present work would not have been possible without the valued help of cetain colleagues and friends. In particular I wish to acknowledge my indebtedness to the following: Messrs. A. J. Sharp and J. K. Underwood, field aids and plant hunters par excellence, whose spirited collaboration at all times was a great inspiration and help. To Mr. C. A. Weatherby I owe much for encouragement and kindly advice, generously given. Dr. H. K. Svenson and Dr. E. T. Wherry contributed many items of interest and importance in a most un-

selfish fashion. The valued assistance of several specialists was had in checking the specific identity of certain plants.

TRICHOMANES PETERSII Gray.[1] On rocks of siliceous nature. Bluff along middle prong of Little River, about five miles beyond Townsend, Great Smoky Mountains National Park, Blount Co. Collected April 11, 1931, *A. J. Sharp, H. M. Jennison and H. Bishop.*[2] A new station was discovered near the original one in April, 1934, by *A. J. Sharp and H. M. Jennison.*

WOODWARDIA VIRGINICA (L.) Sm. In spongy muck soil over limestone, near Whitwell, Marion Co., associated with *W. areolata.* Coll. May, 1931, *Hobart Massey.*

Specimens of this fern from this station have been filed in The Herbarium of the University of Tennessee.

ASPLENIUM EBENOIDES R. R. Scott.

Anderson[3] predicted the possible discovery of this rare fern in Tennessee. Recently Shaver[4] reported having found it growing at two stations near Nashville in Davidson County and at Beersheba Springs, Grundy County.

THELYPTERIS CRISTATA (L.) Nieuwl. With Sphagnum, in humus over mixture of calcareous and siliceous rocks, Shady Valley Swamp, 2800 ft. elev., Johnson Co., July, 1933, *A. J. Sharp and J. K. Underwood.*

THELYPTERIS PALUSTRIS (Salisb.) Schott var. PUBESCENS (Lawson) Fernald. Associated with *Thelypteris cristata* (L.) Nieuwl. and sphagnum in humus over a mixture of calcium-bearing and siliceous rocks. Shady Valley Swamp, 2800 ft. elev., Johnson Co., June 15, 1933, *A. J. Sharp and J. K. Underwood.*

Gattinger[5] lists this fern and many have seen it in Middle Tennessee, but no specimen of it was kept by him. Svenson[6] has collected and presented specimens of the fern in question, from Kingston Springs, Cheatham Co., Aug. 20, 1922. *Svenson* No. 269.

THELYPTERIS PHEGOPTERIS (L.) Slosson (Syn. *Phegopteris polypodiodes,* Fée). In shallow cold soil, near top of Mt. LeConte, Great Smoky Mountains National Park, Sevier Co. Collected June 25, 1933, by *A. J. Sharp and J. K. Underwood.*[7]

Gattinger reports this species from "Mountains of East Tennessee." Dr. Gattinger may have been mistaken in identifying this fern, as have been many others. There were no Gattinger specimens in

[1] Anderson, W. A. Am. Fern Journ. **21** (1931).
[2] Sharp, A. J. Am. Fern Journ. **21** (1931).
[3] Anderson, W. A. Univ. of Tenn. Record. **6** (1929).
[4] Shaver, Jesse M. Am. Fern Journ. **24** (1934).
[5] Gattinger, A. Flora of Tenn. (1901).
[6] Svenson, H. K. Am. Fern Journ. **20**: 145–146. (1930).
[7] Sharp, A. J. & Underwood, J. K. Am. Fern Journ. **23**: (1933).

the destroyed (Jan., 1934) U. T. Herbarium. Collected subsequently (Sept., 1934) by A. J. Sharp.

WOODSIA SCOPULINA D. C. Eaton. Bluff of Nolichucky River, 4 miles south of Erwin, Unicoi Co. *Edgar T. Wherry*, June, 1933.

"This place was discovered by William A. Knight of Biltmore, N. C., but I was the first to identify the Woodsia. (Probably the *W. ilvensis* (L.) R. Br., Gattinger reports is the same thing.) At that locality the fern is unusually luxuriant, which is all the more remarkable in that unlike the other eastern states colonies, it faces east, and is at rather low altitude," E. T. Wherry in letter, Nov. 29, 1933. Gattinger[1] does report *Woodsia ilvensis* (L.) R. Br. as having been collected in Knox. Co., by the late Albert Ruth; but there were no specimens in the U. of T. Herbarium (which included Gattinger's Collection) to substantiate the report.

Specimens of this fern species were collected for the Univ. of Tenn. Herbarium in July, 1934.

PHYLLITIS SCOLOPENDRIUM (L.) Newman (Syn. *Scolopendrium vulgare* Sm.)

Apparently it is only a question of time until the famous isolated colony of this fern, in Marion Co., Tennessee shall have been exterminated. We have known of the situation and have watched it for several years. The station is wholly unprotected and unguarded. Botanical pilgrims from far and near have visited the shrine in the past and some have probably taken away "fragments" of the holy grail. Then too, the natural environment is not conducive to the colony even holding its own. In 1932 we were reliably advised that only about a half dozen plants remained. "In the summer of 1933," reports Dr. E. T. Wherry (letter as of Nov. 29, 1933), "only five (5) plants remain of the former vast colony . . . ." I doubt if ever the colony was a vast one, but it certainly is a fast disappearing one. Unless a Fern Society, or an Ecology Society, or Uncle Sam, or someone establishes a monument at the site of this Hart's Tongue fern colony, and protects it, it will be just a question of time until somebody will propose erecting a memorial to mark the spot.

LYCOPODIUM LUCIDULUM Michx. var. POROPHILUM (Lloyd and Underwood) Clute. In cold wet soil near top of Mt. LeConte, at 6000 ft. elev., Great Smoky Mountain National Park, Sevier Co. Collected May 8, 1933 by *A. J. Sharp.*

ISOETES ENGELMANNI R. Br. var. VALIDA Engelm. In wet humus in creek, Shady Valley Swamp, Johnson Co., 2800 ft. elev. Collected June 14, 1933, by *A. J. Sharp and J. K. Underwood.*

PINUS STROBUS L.

Svenson[1] reported an outpost colony of several trees, which he discovered (Aug., 1922) growing in the summit of the high bluffs south of Craggie Hope, Cheatham Co. This station is well beyond the usual range of this species in Tennessee.

THUJA OCCIDENTALIS L. In shallow soils over dolomite along Clinch River tributaries. Southern outpost, relic colonies in Roan, Anderson, Campbell and Union Counties; Emory Heights station near Harriman, farthest south.

PICEA RUBRA (Du Roi) Dietr. In deep humus over calcareous rocks, Shady Valley Swamp, 2800 ft. elev. June 14, 1933, *A. J. Sharp and J. K. Underwood.* Next nearest (?) station twenty to twenty-five miles (Roan Mt. and White Top Mt.).

It is well known that the Red Spruce occurs abundantly at many places in Tennessee, always, however, at much higher elevations and in or over soils of siliceous origin.

POTAMOGETON PURSHII Tuckerman. In lagoon of Clear Fork River, Morgan Co., about one mile north of Rugby. Coll. June 28, 1933, *H. M. Jennison.*

The specimens collected were immature, and could not therefore be positively identified. However, Prof. M. L. Fernald tentatively refers the material collected to the above named species.

JUNCUS GYMNOCARPUS Coville. Found and collected along Laurel Creek near Bote Mt., Blount Co., Great Smoky Mountains National Park. *A. J. Sharp,* August 21, 1934.

The known occurrence of this species appears to be very limited. Small[2] says: "Acid swamps; known only on coastal Plain in W. Florida and on Appalachian Plateau in Eastern Pennsylvania."

PANICUM LONGIFOLIUM Torr. Discovered and collected in Tennessee, at Tullahoma, Coffee Co., by H. K. Svenson, at "edge of dried swamp" Aug. 24, 1930. *Svenson* No. 4234. Det. A. Chase.

PANICUM CONSANGUINEUM Kunth. Discovered and collected in Tenn., by H. K. Svenson at "edge of dried out swamp," Aug. 24, 1930, Tullahoma, Coffee Co., *Svenson* No. 4235. Det. A. Chase.

PANICUM TRIFOLIUM, Nash. Discovered and collected in Tennessee, Aug. 24, 1930, Tullahoma, Coffee Co., "dried out edge of swamp." *Svenson* No. 4236. Det. A. Chase.

CYPERUS DIPSACIFORMIS Fernald. Discovered and collected by *A. J. Sharp,* Aug. 28, 1934. Wet, sandy soil along Abrams Creek, near boundary of Great Smoky Mountains Park, Blount Co.

Specimens of this rather odd and striking sedge were found growing in sandy alluvium on the flood plain of a creek in the southern Ap-

[1] Svenson, H. K. RHODORA **27**: 27, 28 (1925).

[2] Small, J. K. Manual of the Southeastern Flora (1933).

palachians at an altitude of about 1500 feet above sea level and many miles inland from its best known habitations in the coastal plain province. This is the first report, as far we know, of the occurrence of this species in Tennessee.

Rynchospora capillacea Torr. Wet soil near Cedar Creek, Campbell Co., July 4, 1933, *J. K. Underwood.*

Carex Ruthii Mackenzie. This rare mountain sedge we find in rich wet soil at "Grassy Patch," Great Smoky Mountains National Park, Sevier Co., at 4000 ft. elev. Coll. Aug. 12, 1930 by *J. K. Underwood.*[1] Also, in wet rich soil, Roan Mt., 6000 ft. elev., Carter Co., July 11, 1931, *J. K. Underwood.*

Carex eburnea Boott. This sedge has been collected several times in East Tennessee within the past forty years, but was first turned up in Middle Tennessee by H. K. Svenson as noted. Limestone soils on dry slope of bluffs, Trumble Creek. Craggie Hope, Cheatham Co., Aug. 22, 1930, *Svenson,* No. 4210. Vide J. K. Underwood, l. c.

Carex platyphylla Carey. Limestone soils, Clinch River watershed, Roan, Union, Grainger and Campbell counties, 1933, *J. K. Underwood.*

A specimen of what proves to be this species was collected at Emory Heights, Roan Co., in 1898 by T. H. Kearney. Vide J. K. Underwood, l. c.

Carex laxiculmis Schwein. Paradise Ridge, Oak Barrens, Middle Tennessee. Legit *Dr. A. Gattinger* (no date). Low ground in woods along a stream near Lea Lakes, Blaine, Grainger Co., June 17, 1931, *J. K. Underwood.* Moist alluvial soils, Union Co. and Johnson Co., summer 1933, *J. K. Underwood.*

What appears to be the above named species was reported by Gattinger as *C. digitalis,* occurring in "low ground over the state." A single sheet in the Gattinger Collection originally at the University of Tennessee is all we had to support Gattinger's record. Later day collections in East Tennessee by J. K. Underwood more or less substantiate Gattinger's statement.

Carex cherokeensis Schwein. This rare species was found growing in the cedar glades at Lavergne, Rutherford Co., by *H. K. Svenson,* June, 1930.

Carex folliculata L. In the wet humus, Shady Valley Swamp, 2800 ft. elev. Johnson Co., June 14, 1933, *J. K. Underwood.* Not before reported from Tennessee.

Carex rostrata Stokes. A sedge of the north country heretofore not known to occur farther south than Delaware. Discovered last summer (1933) in upper East Tennessee. In shaded wet, boggy

[1] Underwood, J. K. Journ. Tenn. Acad. Sci. 7: 104 (1932).

places, Shady Valley Swamp, 2800 ft. elev., Johnson Co., June 14, 1933. *J. K. Underwood and A. J. Sharp.* Vide J. K. Underwood, l. c.

Carex projecta Mack. In wet humus. Shady Valley Swamp, Johnson Co., first collected in Tennessee, June 14, 1933, by *J. K. Underwood.*

Carex Crawfordii Fernald. With grasses in moist rich soil in open "park" at 4200 ft. elev., on Roan Mt., Carter Co., July 11, 1931, *J. K. Underwood.*

Arisaema nephenthoides Mart. Persisting on places where planted and later abandoned in region around Knoxville. An occasional plant offered for sale at the Market House in Knoxville. Specimen formerly in U. of T. Herbarium, (destroyed in Morrill Hall fire, Jan. 18, 1934). Coll. spring 1932, *H. M. Jennison.*

Xyris torta Smith. Specimens collected by Gattinger (1881), the writer (1930) and possibly others were identified as *X. flexuosa,* a name now to be replaced by *X. torta* Sm. Damp sandy soil in "oak barrens" near Mayland, Cumberland Co., July 12, 1930, *H. M. Jennison.* Moist places, gravelly oak woods six miles east of Crossville, Cumberland Co., *H. K. Svenson* No. 4155.

Belamcanda chinensis (L.) DC. "Introduced (?)".[1] Collected in isolated place, Brown's Mt., Knox Co., June 1925, *H. M. Jennison.* Abundant in isolated places, Clinch River watershed, *A. J. Sharp,* 1933.

Gattinger wrote in 1901: "Very abundant, I collected it already fifty years ago in the remotest mountain glens, and think it is really indigenous, not naturalized from Asia."

Habenaria lacera (Michx.) R. Br. Found growing in deep moist humus in woods. Coll. in Shady Valley Swamp, Johnson Co., at 2800 ft., elev., June 14, 1933, *J. K. Underwood and A. J. Sharp.*

Gray's Manual (1908) gives distribution as "wet or moist open ground, Nfd. to Minn., southward to Mo. and Ala."

Epipactis pubescens (Willd.) A. A. Eaton. As predicted by Gattinger this orchid was collected in the high mountains of East Tennessee, but a remarkable discovery by H. K. Svenson in 1930 extends its range to Middle Tennessee. "In leaf mould, summit of bluff along Turnbull Creek, Cheatham Co., Aug. 22, 1930," *Svenson* No. 4215.

Listera Smallii Wiegand. In rich wet humus, Shady Valley Swamp, Johnson Co., 2800 ft. elev., coll. June 18, 1933, *H. M. Jennison and A. J. Sharp.*

Buckleya distichophylla (Nutt.) Torrey. "One of our rarest plants," said Sargent, but Paint Rock, Cocke Co., was *not* "only place in America" (ibid.) where it grew wild. The Paint Rock colony has been destroyed. Coll. at Wolf Creek, 1500 ft., elev. 1928, 1930, 1932. *H. M. Jennison.*

The late W. W. Ashe recalled having collected it on the south fork

[1] Robinson, B. L. & Fernald, M. L. Gray's New Manual of Botany (1908).

of Holston River and certain of its tributaries in southwest Virginia and Tennessee, and he also recalled having seen it along waters of Pigeon River and in Haywood Co., North Carolina. Sept., 1933, A. J. Sharp and J. K. Underwood discovered a colony of this rare shrub along the banks of a stream tributary to the Holston River in Johnson Co., Tennessee. "On Bluff of Nolichucky River four miles south of Erwin" reports E. T. Wherry in a letter of Nov. 29, 1933. "Another rarity," he continues, "but the natives are cutting the hemlocks, so it is likely to be exterminated there."

Summary: Occasional in sandy soils under hemlocks, banks of streams tributary to Holston and French Broad Rivers.

Polygonum opelousanum Riddell. A plant of the coastal plain and adjacent provinces. Discovered and collected in Coffee Co., Tenn., Aug. 24, 1930 by H. K. Svenson. Found growing at "margin of swamp." *Svenson* No. 4233.

Ranunculus laxicaulis (T. & G.) Darby. Gattinger catalogues *R. obtusiusculus*, as occurring in "ponds along the Cumberland River," but we did not have a single specimen of this species in the old U. T. Herbarium until collections of it were made in the Shady Valley Swamp, 2800 ft. elev., Johnson Co., August 1933, *A. J. Sharp and J. K. Underwood*. "Chiefly at low altitudes."[1] All our specimens of this species were destroyed by fire on Jan. 18, 1934.

Ranunculus allegheniensis Britton. Known to occur in the Blue Ridge and more northernly provinces, but not heretofore reported from Tennessee. Collected at middle elevations, Rip-shin ridge, base of Roan Mt., Carter Co. *A. J. Sharp*, May, 1934.

Caltha palustris L. Found in muck soil in Shady Valley Swamp, Johnson Co., by *A. J. Sharp and J. K. Underwood*, May 1934. Gattinger reported having found it in "boggy mountain meadow, Ducktown," but there was no specimen in the Gattinger herbarium (destroyed in the Morrill Hall fire Jan. 18, 1934).

Drosera rotundifolia L. Discovered growing in sand and humus in "pockets" on sandstone cliff along a creek, in a forested area. Coll. near Allardt, Fentress Co., *A. J. Sharp*, Nov. 1933, June, 1934. Collected in a boggy place near Clark Range, Fentress Co., Oct. 1934, *H. M. Jennison*.

Sarracenia sp.

Gattinger reported *Sarracenia purpurea*, L. occurring in "low grounds along Mississippi, Tennessee and Buck Rivers, April." We have never relocated and to the best of my information Gattinger's report has never been substantiated. There were no Tennessee exsiccatae of this species in the Gattinger Collection at the University of Tennessee.

Believing that one or more species of *Sarracenia* should be found growing wild in the Cumberland Plateau region, we have been con-

[1] Robinson, B. L. & Fernald, M. L. Gray's New Manual of Botany (1908)

stantly on the watch for specimens. Recently (13th Oct., 1934) we succeeded in finding a single plant in a bog near Clark Range, Fentress Co. No flowers or fruits were found so it was quite impossible for us to determine the specific identity of the specimen. An overly enthusiastic member of the party dug the only plant found, but we transplanted it promptly in sphagnum and soil from its native habitat, hoping that it would survive and subsequently flower.

SEDUM ROSEUM (L.) Scop. Occurring on some of the high tops of Southern Appalachian mountains.

Wherry "found it practically exterminated by the natives, who grow it in buckets around their cabins." E. T. Wherry, letter of Nov. 29, 1933.

PARNASSIA GRANDIFOLIA DC. Heretofore unknown from Tennessee. In cold wet humus over dolomite rocks, border of woods along Cedar Creek, Anderson Co., July 4, 1933, *A. J. Sharp and J. K. Underwood.*

This station will have been inundated a year or two hence when the Norris Lake basin fills.

RIBES CURVATUM Small. Not heretofore reported to be growing wild north of Stone Mt. Georgia (It appears to have "escaped" in the vicinity of Highlands, North Carolina, where it was planted several years ago). Discovered growing in abundance in well-drained rocky soil along creek near Pikeville, Bledsoe Co., by "A White Pine Blister-rust Scout," May, 1934. Later (July 14, 1934) collected near Whitwell, Hamilton Co., by *J. K. Underwood and A. J. Sharp.* Specimens in U. of T. Herbarium.

RIBES LACUSTRE (Pers.) Poir. The above-named species was discovered growing in a colony of considerable size near the top of Mt. LeConte, 6300 ft. elev., Great Smoky Mountains National Park. Coll. *A. J. Sharp,* Aug. 1934.

WALDSTEINIA FRAGARIOIDES (Michx.) Trattinick. Reported by Svenson[1] from collections made along the Turnbull River near Craggie Hope, Cheatham Co., Aug. 1922.

This species is quite common in the river-valleys in East Tennessee.

POTENTILLA RECTA L. Poor soil, creek bottoms, upper East Fork of Little River, Great Smoky Mountain National Park, Sevier Co., June 30, 1928, *H. M. Jennison.* In alluvial soil along a stream, near road over Holston Mt., Sullivan Co., June 14, 1933, *A. J. Sharp and J. K. Underwood.*

Well known in waste places, Maine to Ontario, New York, Virginia and Michigan. Not reported by Gattinger. Evidently be-

[1] Svenson, H. K. RHODORA **27**: 27, (1925).

coming more wide spread through being introduced locally, in one way or another.

Rubus tennesseanus L. H. Bailey.[1] Found in soils of siliceous origin on Rich Mountain, Great Smoky Mountain National Park, Sevier Co. Coll. Aug. 1933, *L. H. Bailey.*

Sanguisorba minor Scop. In clay soil, open field near a garden, Knoxville, Knox Co., 1925, *H. M. Jennison.*

Lespedeza sericea Miq. Introduced from the Orient; for some years known to be naturalized and wide-spread in Eagle Creek Valley, Overton Co.

Lespedeza stipulacea Maximowicz. Naturalized from Korea. Now widely established in Middle Tenn., and known to be quite widely naturalized throughout the Mississippi River basin.

Geranium columbinum L. With grasses and *Potentilla recta* L., in alluvium near a stream along highway; probably the site of a road camp. Holston Mt., Sullivan Co., June 14, 1933, *A. J. Sharp and J. K. Underwood.*

A European introduction of more or less frequent occurrence in waste places in northern parts of the coastal plain province. Its discovery in 1933 in upper East Tennessee was a surprise.

Phyllanthus carolinensis Walt. In moist sandy soil, base of eastern front of the Cumberland Mountains, near Speedwell, Claiborne Co., Oct. 15, 1933. *H. M. Jennison and A. J. Sharp.*

This species appears to be the only one representing this tropical genus, which has migrated very far into the United States. We discovered its occurrence in Tennessee last fall (1933).

Pachysandra procumbens Michx. Specimens sent to U. T. by *Mrs. M. M. Betts,* who collected the plants in the vicinity of Memphis, April 1932.

This species is quite frequently collected in the woods in the hilly eastern part of Tennessee. Mrs. Betts' collection from a station near Memphis is from a point over 200 miles west of the well established range of the species.

Berchemia scandens (Hill) Trel. In alluvial soil near creek near Jasper, Marion Co., May 2, 1931, *H. M. Jennison and A. J. Sharp;* also collected by *E. J. Alexander* near White Creek south of Rockwood, Roan Co., Oct., 1933.

The latter station is considerably north of previously reported localities in Tennessee.

Vitis Baileyana Munson. In calcareous soil at roadside near Fountain City, Knox Co., coll. Aug. 1933, by *L. H. Bailey.* "Common

[1] Bailey, L. H. Gentes Herbarum, 3: 270 (1934).

along French Broad River," according to W. W. Ashe who collected it in Cocke Co. (L. H. Bailey letters Dec. 5–18, 1933).

HYPERICUM GRAVEOLENS Buckley. In wet sandy alluvium, edge of Roaring Fork Creek, 4500 ft., elev., Mt. LeConte, Great Smoky Mountain National Park, Sevier Co., June 25, 1933, *A. J. Sharp.* Roan Mountain, Carter Co., July 27, 1889, *F. Lamson-Scribner.* In wet soil with sedges, swamp rose and other plants, Shady Valley Swamp, Johnson Co., 2800 ft. elev., June 14, *A. J. Sharp and J. K. Underwood.*

Gattinger reported this species from "Summit of Thunderhead" (mountain), but from this one cannot tell whether the station is in Tennessee or North Carolina. We now have records to prove that this plant occurs on the Tennessee side of the high mountains.

HYPERICUM MITCHELLIANUM Rydb. Specimens of this species were found and collected in Tennessee on Mt. Collins, at about 5000 ft. elev., in the Great Smoky Mountains National Park. *A. J. Sharp,* Aug. 6, 1934.

HYPERICUM ELLIPTICUM Hook. In wet soil, open field. Coll. near Elizabethton, Carter Co., June 14, 1933, *A. J. Sharp and J. K. Underwood.*

HYPERICUM VIRGINICUM L. With sedges in wet humus, Shady Valley Swamp, Johnson Co., 2800 ft. elev., coll. Aug. 22, 1933, *A. J. Sharp and J. K. Underwood.*

VIOLA RENIFOLIA A. Gray. A distinctly northern species, found in "Arbor Vitae swamps and cold woods, Nfd. to the Mackenzie R., south to N. E., Pa., Mich., and Minn." Plants (probably not seen by Brainerd) collected on summit of Thunderhead Mountain, 5530 ft. elev., July 1888, *Gattinger* were named *V. renifolia* Gray. See also Gattinger.

I am of the opinion that Gattinger was in error in the case referred to above, because (1) the station which is in Blount Co. at an elevation of 5530 ft. is far to the south of the known range of the species; (2) the habitat is extremely dissimilar, not only in the absence of arbor vitae, but also in having soils of siliceous origin; (3) the specimens named by Gattinger (originally in the U. of T. Herbarium) had glabrous leaves of cordate, not reniform shape, and at least one of the plants had a distinct runner.

MALVA MOSCHATA L. In fine textured soil at roadside near Cole Place, Shady Valley, 2800 ft. elev., June 18, 1933, *H. M. Jennison and A. J. Sharp.*

Gattinger predicted the occurrence of this species in Tennessee on his knowledge of its occurrence in south west Virginia. It was discovered growing in upper East Tennessee last summer (1933).

ANGELICA ATROPURPUREA L. Border of woods, Shady Valley

Swamp, 2800 ft. elev., Johnson Co., June 14, 1933, *J. K. Underwood and A. J. Sharp*, 33–167.

An extension of range southward from the latitude of Delaware.

Cornus obliqua Raf. A recent find, occurring in moist soils of limestone origin. Collected on bluffs along Cedar Creek near La Follette, Campbell Co., June and July 1933; *J. K. Underwood.*

A well known inhabitant of low places, near swamps, ponds and lakes in Indiana, especially at the north.

Kalmia carolina Small. In deep humus over limestone bed rock in Shady Valley Swamp, Johnson Co., June 1933, *A. J. Sharp and J. K. Underwood.*

Epigaea repens L. "Sparingly in deciduous and *Pinus virginiana* woods. Not otherwise seen in Middle Tenn." *H. K. Svenson*, in sched. No. 4212, coll. Aug. 22, 1930. Craggie Hope, Cheatham Co., Tenn.

Gray's Manual gives the distribution of this as follows: "Nfd. to Sask., Wisc., Mich., Ky., and Fla." Gattinger catalogues it and gives its distribution as: "Cumberland and Alleghany Mts."

The fruits of this species are not commonly developed it seems, but during the spring of 1933 we found and collected plants with fruit, several times. Again in 1934 plants with fruit were collected.

Gaylussacia brachycera (Michx.) Gray. Found growing in sandy soils, Fentress Co., along Clear Fork River, near Rugby, July 13, 1930, *H. M. Jennison.* Morgan Co., also near Rugby, Aug. 19, 1930, *H. K. Svenson.* Three miles south of Allardt, Fentress County, May 15, 1931, *Essary, Jennison, Sharp and Underwood.*

Gattinger reported this species from "Slopes of Alleghanies," Parksville, Ocoee River, Polk Co. This station is far to the south of the known stations for this species, and as far as I am aware, it has never since been relocated at Gattinger's station. There were no specimens of the species in question from Parksville in the Gattinger collection in the U. T. Herbarium.

Vaccinum macrocarpon Ait. This cranberry, well known in the northeastern United States, was recently discovered growing in a boreal relic bog in upper East Tennessee. With sphagnum in cold peat. Shady Valley Swamp, 2800 ft. elev., Johnson Co., June 14, 1933, *A. J. Sharp and J. K. Underwood.*

Bartonia lanceolata Small. Plants identified as being this species were found growing in a wet acid bog having a sandstone subsoil, near Clark Range, Fentress Co. Collected Oct. 13, 1934, *H. M. Jennison.*

Bartonia paniculata (Michx.) Robinson. Found and collected in Tennessee by H. K. Svenson. Its occurrence in this state is known

to us only through his record: "A few plants in a dense swamp," Hollow Rock Junction (Bruceton), Carroll Co., August 31, 1930. *H. K. Svenson* No. 4382.

Asclepias perennis Walt. Our herbarium records indicate that this milkweed is a coastal plain endemic. At any rate its occurrence and distribution in Tennessee is indicated by the following: Forked Deer River bottoms near Henderson, Chester Co., *S. M. Bain* 161; "River Bottoms through West Tennessee," along Forked Deer River, Haywood Co., *S. M. Bain*, June 1893; swamp. Shiloh, Hardin Co., *H. K. Svenson* No. 4325; low wet sandy places near Reelfoot Lake, Obion Co., *Jason R. Swallen*, No. 2143.

Phlox ovata L. Occurs scattered through five counties in East Tennessee, *viz.*, Cocke, Hamilton, Hawkins, Knox and Roan, according to Wherry.[1]

"A northern Blue Ridge species enters the state. Gattinger had it listed, but he misapplied the name to *P. carolina*, so its authentic report in the state is new." E. T. Wherry, letter of Nov. 29, 1933.

Phlox stolonifera Sims.

"A northern Appalachian species, reaches a southeastern limit in the state, being known in three eastern marginal counties; Cocke, Polk and Sevier. Gattinger knew it (as *P. reptans*) only in Polk Co." E. T. Wherry, letter of Nov. 29, 1933.

Phlox bifida Beck.

Recorded and distributed by Gattinger as *P. stellaria*, from the Cedar glades near Lavergne, Rutherford Co. Wherry has shown this to be the only place in Tennessee where it occurs.

"The rare variety *stellaria* (only 6 stations known) reaches its southeastern limit here (Lavergne). I rediscovered Gattinger's locality, just north of Lavergne, in cedar glades." E. T. Wherry, letter of Nov. 29, 1933.

Phlox subulata L. var. australis Wherry.

Gattinger lists *Phlox subulata* but apparently did not know of its occurrence in Tennessee. He based his inference on collections of this species by J. K. Small on Kates Mountain, West Virginia. Recently (1929) Wherry, Jennison and others have collected it on shale hills near Lea Lakes, Grainger Co.

Conradina verticillata H. M. Jennison[2] (Syn. *C. montana*, Small[3]). Relic colonies in sandy banks along Clear Fork River, Fentress and Morgan Counties about one mile north of Rugby. Coll. July 14, 1930, *H. M. Jennison*, May 16, 1931; *H. M. Jennison and*

[1] Wherry, E. T. Bartonia No. 11 (1929).

[2] Jennison, H. M. Journ. Elisha Mitchell Sci. Soc. **48**: 268 (1933).

[3] Small, J. K. Manual of the Southeastern Flora (1933).

A. J. Sharp, May 28, 1932; *Mrs. Chas. Brooks;* May 28, 1933, *H. M. Jennison.*

The type specimen was destroyed in the Morrill Hall fire on 18th January, 1934. Isotypic specimens were collected May 31, 1934 by H. M. Jennison and A. J. Sharp.

Considerable exploring in this vicinity (Rugby) as well as in similar habitats in the region has failed to turn up other stations where this endemic grows.

Linaria canadensis (L.) Dumort. In clay soil of calcareous nature, Sequatchie Valley, near Dunlap, Sequatchie Co., May 3, 1931, *H. M. Jennison and A. J. Sharp.* (Specimens destroyed in Morrill Hall fire, Jan. 1934.)

A plant of the coastal plain province.

Gattinger reports the occurrence of this species in Tenn. He collected it at the summit of Lookout Mountain, July 8, 1880.

Fifty-one years later we found about an acre of farm garden near a house covered with specimens of the plant. This was at a lower elevation and at a place some miles farther north in Tennessee.

Penstemon brevisepalus Pennell.

"A new species of the Cumberland Plateau and country westward that I first saw at Crossville in 1923. This is to appear in Small's Manual of the Southeastern Flora, and also in my account of the Scrophulariaceae of Eastern North America."—F. W. Pennell's letter of Dec. 7, 1933.

Chelone glabra L. var. elongata P. & W. Wet woods in bottom land of the Mississippi embayment of Western Tennessee. *Pennell and Wherry.*[1]

Chelone obliqua L. "Found in wet wood and cypress swamps—throughout Western Tennessee," *Pennell and Wherry.*

Chelone montana var. elatior (Raf.) P. & W.

Pennell and Wherry say it is the most common typical Appalachian "Turtle head" along stream banks and swamps in mountain forests from northern Georgia to eastern Kentucky and southern Pennsylvania. In Tennessee (E. T. Wherry, letter of Nov. 29, 1933).

Pedicularis lanceolata Michx. In a swamp along U. S. Route 25E near Knox-Union Co. line. Oct. 15, 1933, *H. M. Jennison and A. J. Sharp.*

Indigenous in the north but reported from places as far south as Virginia and North Carolina. Now positively known to grow in

[1] Pennell, F. W. and Wherry, E. T. Bartonia, 1927–28.

Tennessee, though not common nor widely distributed, as far as we know.

SCHWALBEA AMERICANA L.

Gattinger reported this from Tullahoma; but there were no corroborative specimens in the Gattinger Collection in the University of Tenn. herbarium. "None of us who have looked for it in recent years have been able to rediscover it." E. T. Wherry, letter of Nov. 29, 1933.

SHERARDIA ARVENSIS L. Average sized specimens of this species were found growing in clay loam at border of recently seeded athletic field, University of Tennessee Campus, Knoxville, Knox Co. Discovered and collected by *Nina A. Shipe*, June 19, 1928.

EUPATORIUM VERBENAEFOLIUM Michx. Gattinger reports this as having been collected at "Hampton, East Tenn.," by the late Albert Ruth, but Gattinger left no specimens of it in his herbarium. However, by way of corroborating Gattinger's record, I can report its occurrence in East Tennessee, as follows: (1) East of Isabella, Polk Co., Sept. 15, 1930, *A. J. Sharp;* (2) Waste ground, rear of 1905 Prospect Place, Knoxville. *H. M. Jennison*, Sept. 1934.

ASTER SCHREBERI Nees. Shallow soil over dolomite rocks. Bluffs along Cedar Creek, Campbell Co., coll. July 4, 1933. *A. J. Sharp and J. K. Underwood.*

Heretofore distribution given as: New England to Michigan and Virginia.

ASTER TARDIFLORUS L. Wet limestone soil in woods. Bluff along Powell River near Arthur, Claiborne Co. Collected August 28, 1933. *A. J. Sharp and J. K. Underwood.*

HELIANTHUS ANGUSTIFOLIUS L. The "swamp sunflower" was long ago reported in Tennessee by Gattinger from "Craggy Hope, Cheatham Co., and in West Tenn.," but its occurrence on the Cumberland Plateau has not heretofore been recorded, as far as I know. Collected in an acid soil bog near Clark Range, Fentress Co., Oct. 13, 1934. *H. M. Jennison.*

CENTAUREA MACULOSA Lam. In sterile soil in abandoned field. Coll. Aug. 28, 1933, Speedwell, Claiborne Co., *A. J. Sharp and J. K. Underwood.*

CREPIS CAPILLARIS (L.) Wallr. Adventive from Europe; heretofore reported from Connecticut, New York, New Jersey, and Pennsylvania. Discovered growing in upper East Tennessee, summer 1933. In light soil, Shady Valley, 2800 ft. elev., Johnson Co., June 14, 1933, *A. J. Sharp and J. K. Underwood.*

THE UNIVERSITY OF TENNESSEE,
Knoxville.

CRITICAL PLANTS OF THE UPPER GREAT LAKES REGION OF ONTARIO AND MICHIGAN

M. L. Fernald

(*Continued from page 301*)

Epilobium paniculatum Nutt., var. **subulatum** (Hausskn.), comb. nov. *E. paniculatum*, forma *subulata* Hausskn. Mon. Gatt. Epilob. 247 (1884). *E. micranthum* Nutt. ex Hausskn. l. c. (1884), not Pall. ex Hausskn. l. c. 102 (1884). *E. Tracyi* Rydb. Bull. Torr. Bot. Cl. xl. 63 (1913). *E. subulatum* (Hausskn.) Rydb. l. c. 64 (1913).—Ontario: Colpoy's Bay, Bruce Co., 1871, *John Macoun;* Hopkins Harbor, Tobermory, Bruce Co., *Krotkov*, no. 7640; crevices and talus of hornblendic cliffs and ledges, Cloche Peninsula, Manitoulin District, no. 3440; about calcareous ledges in dry woods, south of Little Current, Manitoulin Island, no. 3441.

Var. *subulatum* is the extreme of the species about Lake Huron. Typical *Epilobium paniculatum* Nutt. described with "Flowers nearly as large as in E. palustre, pale red" has been collected farther east, along the Ottawa River in Quebec: Deschênes, 14 juillet, 1921, *Rolland*, no. 15,884. It is a coarser plant, with short pedicels and with calyx 5–6 mm. long, the petals longer. Var. *subulatum* was clearly described by Haussknecht (as forma *subulata*) "Floribus parvis,—5 m.m. longis, petalis calyce sublongioribus; calycis tubo brevi, glabro, 2 m. m. longo. Capsulis 2 c. m. longis, glabrescentibus . . . ; pedicellis capillaribus, 1/2: 1 c. m. longis"; etc. It is the small-flowered extreme of a highly variable cordilleran species; but, having long and slender pedicels, contrasted with the short and stouter ones of the large-flowered typical *E. paniculatum*, its identity is obscured by Rydberg's treatment, in setting up *E. subulatum* as a species:

.... pedicels short .... 2. *E. subulatum.*
.... pedicels slender .... 3. *E. paniculatum.*

E. Tracyi seems scarcely recognizable as different from *E. paniculatum*, var. *subulatum;* and I fully concur in the second half of Rydberg's statement, when he split *E. paniculatum* into "several forms or species," but all treated as species!, that *E. paniculatum* connects "on one hand with *E. minutum*, on the other with *E. jucundum*." In defining his *E. paniculatum*, forma *subulata* Haussknecht included among the specimens cited Macoun's collection from Colpoy's Bay.

Chimaphila umbellata (L.) Bart., var. occidentalis (Rydb.) Blake, Rhodora, xix. 242 (1917). *C. occidentalis* Rydb. Michigan: woods, Mackinac Island, *Hunnewell*, no. 9329; openings and thickets back of crest of West Bluff, Keweenaw Co., no. 3458.

Var. *occidentalis* is the geographic variety (species of Rydberg) of the Pacific slope from British Columbia to north-central California, eastward into Montana, thence along the Rocky Mountains to Utah and Colorado. Its discovery in northern Michigan, where it is associated with scores of plants of similarly disrupted range, is at least a significant item.

Vaccinium membranaceum Dougl. in Hook. Fl. Bor.-Am. ii. 32 (1834) as syn.; Britton in Brit. & Br. Ill. Fl. ii. 576, fig. 2785 (1897), validation of the name. *V. myrtilloides, β. macrophyllum* Hook. l. c. (1834). *V. macrophyllum* (Hook.) Piper, Contrib. U. S. Nat. Herb. xi. 443 (1906).—The common "huckleberry" of the Upper Peninsula of Michigan is typical *V. membranaceum*, occurring otherwise only west of the continental divide from southwestern Alaska to northwestern Montana and the Coast Ranges of northern California. Its mature leaves are membranous, green on both sides, varying from lance-oval to ovate, acuminate above, 3–7 cm. long, 1.5–3.5 cm. broad. In central and eastern Washington and Oregon it passes gradually into a shrub with smaller leaves, 1–5 cm. long, 1–2.5 cm. broad, firmer, usually paler beneath and of an oblong to elliptic outline, with rounded to merely acutish (not long-acuminate) tips. This is

Var. **rigidum** (Hook.), comb. nov. *V. myrtilloides, γ ? rigidum* Hook. Fl. Bor.-Am. ii. 32 (1834). *V. globulare* Rydb. Mem. N. Y. Bot. Gard. i. 300 (1900).—Central Alberta (Lesser Slave Lake) and southern British Columbia to Colorado and Arizona. See p. 210 and map 7.

A specimen, sent by Hooker in 1835 to Jacques Gay and now in the Gray Herbarium, marked *Vaccinium myrtilloides* Hook. Fl. Bor.-Am. is the small-leaved shrub described by Rydberg as *V. globulare*.

Gentiana rubricaulis Schwein. Michigan: glades and openings in thickets bordering calcareous beach of L. Michigan, east of Manistique, no. 3482.

Gentiana rubricaulis, one of the most definite of species, has been quite misinterpreted. Gray, in 1878, partly understood it but he reduced it to varietal rank as *G. linearis*, var. *lanceolata* Gray, Syn. Fl. N. Am. ii.[2] 123 (1878), giving a partially correct description of the true *G. rubricaulis* from "Minnesota along Lake Superior"; but adding "Also Herkimer Co., New York, *Paine*," the latter, as shown by his material, being merely a broadish-leaved *G. linearis* Froel. Subsequently, Gray partly cleared the situation, or perhaps further confused it, by publishing *G. linearis*, var. *latifolia* Gray, Proc. Am.

Acad. xxii. 309 (1887), for the "form from Lake Superior," adding the comment: "I have some reason to suppose that it is also *G. rubricaulis* of Schweinitz from the same region."

The segregation of *Gentiana linearis*, var. *latifolia* properly recognized the plant which is unquestionably what had been described as *G. rubricaulis* Schwein. in Keating's Narr. Long's Exped. ii. 384 (1824); but later authors (Britton and Robinson & Fernald) failed to clarify the situation, the former merging with *G. rubricaulis* the *G. linearis*, var. *lanceolata* from "central New York," the latter placing *G. rubricaulis* in the synonymy of var. *lanceolata*. Schweinitz's description was very clear and fragments of the type, presented many years ago to Asa Gray, show conclusively the identity of his species:

28. Gentiana * *rubricaulis*, L. v. Schw.

Though there were but two specimens of this Gentiana, (one of which I was under the necessity of sacrificing to the examination,) it presents so distinct an appearance that I have little doubt it will prove a new species, intermediate between *G. pneumonanthe* and *G. ochroleuca*. I describe it thus:

Stem erect, simple, terete, very smooth and firm, of a red colour; about one foot in height. *Leaves* about one inch in length, alternately opposite at intervals, oblong-lanceolate, of thick consistency, smooth, entire in margin and slightly undulate, obtuse, sessile and sub-amplexicaule or connate at base, with three nerves, the two lateral ones inconspicuous. The upper leaves forming a pseudo-involucrum of ovate leaves, not exceeding the corollas in length. Involucrum and leaves sub-erect. *Corollas* campanulate, erect, sessile, terminal, fasciculate or single, subquinquefid. Segments sub-connivent, the interior plait with a single tooth. *Calyx* very small in proportion to the flower, 5-fid.

Appears to have been bluish.

G. caule tereti glabro rubro: foliis oblongo-lanceolatis, trinerviis, obtusis. Corollis terminalibus fasciculatis sessilibus, 5-fidis campanulatis non ventricosis, laciniis acutis conniventibus; plicis interioribus unidentatis.

Hab. Prairies of St. Peter's river.

A detailed study shows that this characteristic plant of the Upper Great Lakes region, from western Ontario across northern Michigan to Minnesota, with isolated eastern outliers in Somerset Co., Maine and in Charlotte Co., New Brunswick, is quite distinct from *G. linearis*. The specific distinctness of the two was clearly recognized by Kusnezow who redefined the plants which are really *G. rubricaulis* as *G. Grayi* Kusnezow, Acta Hort. Petrop. xiii. 59 (1893), this later appearing as *Dasystephana Grayi* (Kusnezow) Britton in Britton & Brown, Ill. Fl. ed. 2, iii. 13 (1913), where Britton perpetuated the error of assigning *G. rubricaulis* to the synonymy of *G. linearis* and still further carried on the confusion by stating of his *D. Grayi* that

it is "Recorded from central New York." The record from central New York was, of course, that of Paine's broad-leaved (but quite frequent) extreme of *G. linearis*, already discussed. *G. rubricaulis* seems to be particularly common on calcareous areas about Lake Superior and upper Lake Michigan.

Apocynum sibiricum Jacq., var. **cordigerum** (Greene), comb. nov. *A. cordigerum* Greene, Leafl. ii. 164 (1911). *A. Farwellii* Greene, l. c. 168 (1911). *A. hypericifolium* Ait., var. *cordigerum* (Greene) Bég. & Bel. Atti R. Accad. Lincei, V. ix. 114 (1913); Woodson, Ann. Mo. Bot. Gard. xvii. 141 (1930). *A. hypericifolium* Ait., var. *Farwellii* (Greene) Woodson, l. c. 140 (1930). Ontario: limestone pavement and gravel, Great Cloche Island, no. 3484.

Although Woodson treats var. *cordigerum* as a plant of the "upper Mississippi Valley," the representation in the Gray Herbarium shows it to be, likewise, in the drainage of the St. Lawrence and the Hudson to the east, and of the Saskatchewan to the northwest. Thoroughly characteristic specimens are before me from Indiana and Ohio, with a number from New York (south of Tripoli, Lake George region, July 5, 1914, *Burnham;* Newtown Pond, Junius, *Wiegand*, no. 3038; Westbury bog, Butler, *A. H. Wright*, no. 12,759). I am quite unable to see a distinct variety in *A. Farwellii.* Woodson treated it as a variety because it is "pubescent," but the specimens which I have seen (cited by him) have the hairs so few and so localized on the young growth that one must rake the specimens carefully with a lens to find them. In publishing *A. Farwellii* as a species Greene said: "main stem glabrous . . . up to the middle, above that, as also the branches, hirsutulous . . . leaves . . . all glabrous or nearly so above, sparsely fuscous-pubescent beneath." That was Greene's account of one individual, but there was another "in less pubescent, indeed almost glabrous state."

Woodson, quite misinterpreting the International Rules of Botanical Nomenclature, maintained the later name, *A. hypericifolium* Ait. Hort. Kew. i. 304 (1789), and rejected the clearly described and beautifully illustrated *A. sibiricum* Jacq. Hort. Vindob. iii. 37, t. 66 (1770). In apologizing for this irregular procedure he said:

> Jacquin published *A. sibiricum* nineteen years previous to the publication of *A. hypericifolium* Ait. Moreover, the description of the former was accompanied by a full-page folio illustration of the habit of the plant. The Latin description of the former, also, was far more elucidating than the unillustrated and terse description of Aiton. However, as can be quickly perceived by a glance at the citations in literature on page 133, botanists were quick to take up *A. hypericifolium* Ait., while *A. sibiricum*

Jacq., perhaps because of the misleading geographical adjective, was disregarded for over a hundred years after its publication. In such a case, the practical course is to follow the so-called "Fifty year rule" tacitly established in the International Code of Nomenclature, and adopt the better-known designation.[1]

Although the motive, to reject an inappropriate name in favor of an appropriate one (as was done by many authors in the days before our existing rules of nomenclature) is commendable, it is certainly difficult to find anything in the International Rules or any other code about a "Fifty year rule" for species. The author doubtless had vaguely in mind the old "Berlin rule," which was the basis for the original list of *nomina generica conservanda*. No specific names are free from the priority principle.

Typical *Apocynum sibiricum* of Jacquin was the erect form, so illustrated and clearly described "Caules annui, erecti . . . sesquipedales." On the sands and gravels of much of Canada and the adjacent states it is quite prostrate, and erect plants are absent or difficult to find. This is

A. sibiricum Jacq., forma **arenarium** (F. C. Gates), comb. nov. *A. hypericifolium*, prostrate, Schaffner, Ohio Nat. x. 184, fig. 1 (1910). *A. hypericifolium*, f. *arenarium* F. C. Gates, Torreya, xi. 128 (1911).

The western American *Apocynum sibiricum* is superficially like the typical plant, in having the middle leaves narrowly oblong to oblong-lanceolate, acute and with merely rounded to cordate bases (instead of oval or broadly ovate-oblong, rounded or obtuse or merely subacute and with cordate-clasping bases as in var. *cordigerum*), but this western extreme has more slender corolla-tube than typical *A. sibiricum* and the coma of the seed is longer. This is

A. sibiricum Jacq., var. **salignum** (Greene), comb. nov. *A. salignum* Greene, Pittonia, v. 64 (1902). *A. hypericifolium*, var. *salignum* (Greene) Bég. & Bel. l. c. 115 (1913); Woodson, l. c. 141 (1930).

Hackelia deflexa (Willd.) Opiz, var. americana (Gray) Fern. & Johnst. Rhodora, xxvi. 124 (1924). Michigan: borders of open woods north of Garden, Delta Co., and on shaded talus of limestone cliff, Burnt Bluff, Delta Co., nos. 3491, 3492.

Previously recorded, either as *Lappula americana* (Gray) Rydb. or *L. deflexa* (Willd.) Garcke from Cheboygan Co.

Mertensia paniculata (Ait.) G. Don, var. subcordata (Greene) Macbride. Michigan: brookside in woods, south of L'Anse, Baraga Co., no. 3493.

[1] Woodson, *A Monograph of the Genus Apocynum*. Ann. Mo. Bot. Gard. xvii. 139 (1930).

In his *Studies in the Boraginaceae, IX*, Contrib. Arn. Arb. iii. 85 (1932), Johnston restricts var. *subcordata* to Washington, Oregon and Idaho. Our material, which he identifies without question as var. *subcordata*, adds another to the long series of identities in the floras of the Pacific slope and of the Upper Great Lakes.

LITHOSPERMUM **croceum**, sp. nov. (TAB. 376, FIGS. 1–5). Perenne e radice longe et recte descendenti; caulibus 1.5–6 dm. altis pilosis; foliis subuniformibus lineari-oblongis vel lanceolatis obtusis vel subacutis adscendentibus plerumque 33–45 infra inflorescentiam, majoribus 2–5 cm. longis 3–15 mm. latis utrinque papilloso-hispidis pilis ca. 1 mm. longis; racemis floriferis dense corymbis 3–8 cm. diametro, racemis fructiferis elongatis 1–2 dm. longis strictis; bracteis late lanceolatis vel ovatis foliis similibus calices maturos valde superantibus fructiferis imbricatis; floribus breve pedicellatis; lobis calicis lanceolato-acuminatis valde carinatis papilloso-hispidis fructiferis 10–15 mm. longis; corollis croceis extus pilosis, tubo infundibuliformi exserto ad basin contracto poro minuto intus glabro basi barbato excepta, limbo 1.5–2 cm. diametro lobis oblongo-rotundatis opacis venis confluentibus; fauce vix vel breve appendiculato; staminibus inclusis, filamentis quam antherae oblongae brevioribus; nuculis albidis lucidis 3.5–4 mm. longis.—Sands, gravels and sandy woods, thickets and bluffs near the Great Lakes from western New York and Ontario westward, thence to Montana, South Dakota, Nebraska and Kansas. TYPE: calcareous sand back of beach of Lake Michigan, east of Manistique, Michigan, July 9, 1934. *Fernald & Pease*, no. 3494 (in Gray Herb.).

Lithospermum croceum is the plant of the sands of the Great Lakes region and of the plains westward and southwestward to Montana, South Dakota, Nebraska and Kansas which long passed as *L. hirtum* (Muhl.) Lehm., then as *L. Gmelini* (Michx.) Hitchc. and more recently as *L. caroliniense* (Walt.) MacMill. Those are all synonymous names and they go back for their typification to *Anonymos caroliniensis* Walt. Fl. Carol. 91 (1788), a characteristic species of the coastal plain from South Carolina to Florida, thence to eastern Texas and adjacent Mexico, Arkansas and Oklahoma.

The southern coastal plain species is finely pilose, the hairs of stem and foliage (FIG. 6) much more abundant and less papillose-based than in the inland and more northern species, the lower cauline leaves very much smaller than the middle and upper, the latter well developed leaves only 15–25 below the branching inflorescence, with the midrib dorsally minutely pilose; the branches of the mature inflorescence are loosely ascending or spreading, with the bracts becoming distant; the mature calyx (FIG. 7) is slender-pedicelled, the pedicels ultimately

1/3–2/3 as long as the calyx, and the calyx-lobes are flat, with slender midrib and villous (instead of papillose)-hispid; the corolla is larger, paler, and of thinner texture, the limb 2–2.5 cm. broad, the throat with elongate appendages, the outside minutely appressed- or sericeous-pilose, the tube minutely pilose within, the veins (fig. 8) continuing without evident anastomosing into the lobes. This southern species was first described as *Anonymos caroliniensis* Walt. Fl. Carol. 91 (1788). It was promptly renamed *Batschia caroliniensis* Gmel. Syst. i. 315 (1791) and, in the same year, *Lithospermum carolinianum* Lam. Tab. Encyc. i. 397 (1791). Somewhat later, with the probable desire to honor Gmelin for giving a generic identification to Walter's *Anonymos caroliniensis* and with complete disregard for the principle of priority which later became so important, it appeared as *Batschia Gmelini* Michx. Fl. Bor.-Am. i. 130 (1803). Yet again, regardless of the older and properly published names, Lehmann picked up a *nomen nudum* of Muhlenberg's—*Anchusa hirta* Muhl. Cat. 19 (1813)—and described *Lithospermum hirtum* Lehm. Asperif. ii. 304 (1818) from South Carolina, with the names of Walter, Gmelin and Michaux all cited as synonyms. As if this beautiful species of the southern coastal plain had not been sufficiently named, Rafinesque got it from Florida and described it as *L. strigosum* Raf. New Fl. N. Am. pt. iv. (Neobotanon), 18 (1836) and Alphonse DeCandolle, from a very inadequate Texan specimen, described it as *L. bejariense* A. DC. Prodr. x. 79 (1846). When two of the older names were transferred as *L. caroliniense* (Walt.) MacMillan, Metasp. Minn. Val. 438 (1892) and as *L. Gmelini* (Michx.) Hitchc., Spring Fl. Manhattan, 30 (1894), their authors had before them local material of *L. croceum*. Nomenclaturally, however, their combinations finally rest upon *Anonymos caroliniensis* Walter from South Carolina.

Yet the quite distinct northern and inland plant was regularly confused with the southern species and among the surplus of names proposed I can find none which designates it; nearly every one was content to rename the plant of South Carolina which Walter had originally described. In its very harsh pubescence *L. bejariense* A. DC. from eastern Texas, an isotype of which is before me, suggests *L. croceum*, but *L. bejariense* has the abruptly smaller lower leaves, the scattered fruiting bracts, the plane calyx-lobes and the characteristic venation of throat and lobes of the corolla of *L. caroliniense;* and it is apparently a variation of the latter species, to which it was properly assigned by Johnston, Contr. Gray Herb. lxx. 31 (1924).

PLATE 376, FIG. 1 shows a small flowering plant, × 1/2 from the TYPE collection of *Lithospermum croceum;* FIG. 2, the top of a fruiting plant, × 1/2, from Illinois; FIG. 3, a portion of the back of a bract, × 10, of the type, to display characteristic pubescence; FIG. 4, a fruiting calyx, × 3, to show the keel and the stiff ciliation of the calyx-lobes; FIG. 5, the venation of the opaque corolla-lobe, × 10, cleared for photographing by boiling in alcohol and then mounting in glycerine. The other figures, representing details of *L. caroliniense*, are noted in a preceding paragraph.

HEDEOMA HISPIDA Pursh. MICHIGAN: sand plain south of Iron Mountain, Dickinson Co., no. 3501.

Beal cites only a single station, near the southeastern corner of the state.

COLLINSIA PARVIFLORA Lindl. To the stations already recorded from the Keweenaw Peninsula add: wind-swept crests, crevices and talus of sandstone-conglomerate, West Bluff, Keweenaw Co., nos. 3512 (large, still flowering on July 4), 3513 (small, with capsules open).

MIMULUS MOSCHATUS Dougl. To the records from northern Michigan add: seepy bank in rich, deciduous woods, Delaware, Keweenaw Co., no. 3514.

Farwell had already collected *Mimulus moschatus* at Delaware in 1885 (his no. 277, from banks of brooks and moist places, "Indigenous to the Keweenaw Peninsula." He made a similar memorandum on his no. 5975 from streams near Lake Linden. In northern Michigan as elsewhere in the East, notably in Newfoundland and on the Magdalen Islands, the species seems to be indigenous.

VERONICA SCUTELLATA L., var. VILLOSA Schumacher. ONTARIO: by pool in argillaceous swale near Warren, Sudbury District, no. 3517.

In RHODORA, xxiii. 38 (1921) Pennell reduces the pubescent plant to formal rank, as forma *villosa* (Schumacher) Pennell, and states that it "occurs sporadically occasional throughout the range of the species." It may be so, but in nearly fifty years of intimate knowledge of *V. scutellata* in the area from Labrador and Newfoundland to western New York and Virginia, I had never seen the pubescent plant growing until I went to Lake Huron in the summer of 1934. In the very extensive collections of the Gray Herbarium and of the New England Botanical Club it is not represented from Labrador, Newfoundland, the Maritime Provinces, Quebec and New England, whence it should have been collected if present. All the material in the Gray Herbarium is from the Great Lakes area and the Puget

Sound area (western New York to Lake Superior; southwestern British Columbia, Vancouver Island and northwestern Washington). This range is so nearly identical with that of many other plants of the Great Lakes region that I am inclined to retain var. *villosa* as a geographic variety. When John Macoun described it as var. *pubescens* Macoun, Cat. i. 361 (1884) he knew it only from Belleville on Lake Ontario, saying: "It is the only form found there." This was the case, likewise, at the pool in Warren.

UTRICULARIA GEMINISCAPA Benj. (*U. clandestina* Nutt.). MICHIGAN: pools with *Potamogeton Oakesianus* Robbins, *Eleocharis Robbinsii* Oakes, *Eriocaulon septangulare* With., *Drosera intermedia* Hayne, etc. in bog near Rock River, Alger Co., no. 3521.

Perhaps the first record from Michigan; already known in Wisconsin.

PLANTAGO PURSHII R. & S. MICHIGAN: sandy open pine barrens north of Gladstone, Delta Co., no. 3524.

Apparently the first record from the Upper Peninsula. The plant seemed to be a part of the indigenous flora.

LONICERA VILLOSA (Michx.) R. & S., var. SOLONIS (Eaton) Fernald, RHODORA, xxvii. 6 (1925). MICHIGAN: arbor-vitae swamp near Eckerman, no. 3527.

When I studied the variations of *Lonicera villosa*, I had var. *Solonis* from Isle Royale but not from the mainland of Michigan.

VIRBURNUM AFFINE Bush. MICHIGAN: wind-swept crests, crevices and talus of sandstone-conglomerate, West Bluff, Keweenaw Co., no. 3537.

When Blake, RHODORA, xx. 14 (1918), divided *Virburnum affine*, he recognized the glabrous-leaved typical form from Ontario, Illinois, Minnesota, etc., but not from Michigan; the Michigan shrub recognized by him being var. *hypomalacum* Blake, l. c.

ASTER NEMORALIS Ait. MICHIGAN: larch swamp near Emerson, Chippewa Co., no. 3550.

Although Beal lists *Aster nemoralis* as "Common Th [roughout]," I find no other record of it from Michigan, nor has a specimen from so far west previously reached the Gray Herbarium.

ANTENNARIA RUPICOLA Fern. See RHODORA, xxxv. 342, 343, map 26, where no stations were indicated on the Great Lakes, except at the northwest side of Lake Superior. The following are more easterly. ONTARIO: limestone pavement and gravel, Great Cloche Island, Manitoulin District, no. 3556; dry soil, Jack Fish, Thunder Bay Distr., *Pease & Bean*, no. 23,475; roadside, Schreiber, *Pease & Bean*, no. 23,597.

Adenocaulon bicolor Hook. To the comparatively few recorded stations about the Upper Great Lakes add: Ontario: Cape Croker, Indian Peninsula, Bruce Co., July, 1895, *A. Y. Massey* (Can. Nat. Herb.). Michigan: deciduous woods between Rock River and Sand River, Alger Co., no. 3562; rich, deciduous woods (with *Polystichum Lonchitis*), Delaware, Keewenaw Co., no. 3563. See p. 210 and maps 8 and 9.

Coreopsis lanceolata L. Ontario: in great profusion and very showy on talus of hornblendic cliffs and ledges, Cloche Peninsula, Manitoulin Distr., no. 3564.

This station (very extensive) is recorded, since Macoun (Cat.) cited only vague and somewhat general areas, without definite localities.

C. lanceolata, var. villosa Michx. Michigan: sandy barrens west of Norway, Dickinson Co., no. 3566.

Apparently not recorded from north of Illinois.

The Varieties of Tanacetum huronense (Plates 377 and 378). —The native tansy of eastern North America occurs in five widely segregated areas. The typical plant, described by Nuttall from "sandy shores of Lake Huron, near Michilimakinak; abundant," occurs on the sands and gravels of Lakes Huron, Superior and Michigan. Never properly represented in the Gray Herbarium, the Great Lakes plant has been considered inseparable from the plant of the St. John valley in Quebec, New Brunswick and Maine and the adjacent (and formerly confluent) valley of the Restigouche, a plant abundantly represented in the Gray Herbarium and the herbarium of the New England Botanical Club. Our collection of the typical Great Lakes plant is now, happily, augmented and it is clear that the isolated plant of the St. John and Restigouche valleys is a strongly marked geographic variety. Farther east, on the river-gravels of Anticosti, the plant combines the characters of the typical Great Lakes variety and that of the St. John and the Restigouche, while the plant from dunes of James Bay and eastern Hudson Bay seems to be that of Anticosti. Farthest east, the usually monocephalous and densely lanate plant of the west coast of Newfoundland, var. *terrae-novae*, exhibits the most extreme departure from the type of the species.

The characters of these four geographic varieties of *Tanacetum huronense* are briefly stated below and the plates bring out the essential differences.

a. Flowering stem 4–8 dm. high, with 7–15 green leaves: corymb with 6–30 heads: leaves oblong, with oblong to oblanceolate pinnae . . . . Var. *typicum*.

a. Flowering stem 0.4–4.5 dm. high: corymb with 1–6 heads . . . . *b*.

b. Leaves oblong to narrowly elliptic, the larger 4–10 cm. long, 2–5 cm. broad; the pinnae oblong to oblong-oblanceolate, blunt, with approximate to imbricated pinnules . . . . *c*.

c. Flowering stems 1.2–3 dm. high, glabrous to sparingly pilose (except at summit), with 4–10 green and sparsely pilose leaves above the basal rosette: heads 2–6. . . . . Var. *bifarium.*

c. Flowering stem 0.4–2 dm. high, copiously lanate, with 1–4 white-lanate leaves above the basal rosette: heads 1 or 2 (rarely –4). . . . . Var. *terrae-novae.*

b. Leaves (especially the basal and median) elliptic, the larger 1–3 dm. long, 0.35–1.4 dm. broad; pinnae remote, with remote simple to much dissected acute pinnules: flowering stems 2–4.5 dm. high, with 5–10 leaves and 1–5 heads. Var. *johannense.*

T. HURONENSE Nutt., var. **typicum** (PLATE 377, FIGS. 1 and 2). *T. huronense* Nutt. Gen. No. Am. Pl. ii. 141 (1818).—Sands and gravels of Lakes Huron, Michigan and Superior.

Var. **bifarium,** var. nov. (TAB. 377, FIGS. 3 et 4), var. *typico* simillima a qua differt caulibus 1.2–3 dm. altis glabris vel sparse pilosis; foliis caulinis 4–10 sparse pilosis oblongis vel anguste ellipticis majoribus 6–10 cm. longis 2–5 cm. latis, pinnis oblanceolatis obtusis, pinnulis obtusis; capitulis 2–6.—Anticosti Island, QUEBEC: sur les platières de l'embouchure, Rivière Jupiter, 10 août 1926, *Victorin & Rolland,* no. 25,177; sur les platières au-dessus des gorges, Rivière Chicotte, 15 août 1926, *Victorin & Rolland,* no. 25,176; sur les platières, R. des Caps, 25 juillet 1927, *Victorin & Rolland,* no. 27,566; sur les platières argilo-calcaires, avec *Solidago Victorinii,* R. McKane, 30 juillet 1927, *Victorin & Rolland,* no. 27,564 (TYPE in Gray Herb.). UNGAVA DISTR.: east coast of Hudson Bay, Smith Sound, August 24, 1928, *Malte,* no. 120,894; sandy shore of Hudson Bay, Port Harrison, August 18–20, 1928, *Malte,* no. 120,720; sand dunes near the Post, Charlton Island, July 6, 1929, *David Potter,* no. 25.

Var. TERRAE-NOVAE Fernald, RHODORA, XXV. 14 (1923). PLATE 378, FIGS. 1–4. Peaty turfy or gravelly limestone barrens of western Newfoundland, in typical development from the shore of Pistolet Bay to Ingornachoix Bay; the plant of Cape St. George approaching var. *bifarium.*

Var. **johannense,** var. nov. (TAB. 378, FIGS. 5 et 6), foliis imis mediisque late ellipticis majoribus 1–3 dm. longis 0.35–1.4 dm. latis, pinnis remotis, pinnulis remotis acutis simplicibus vel valde dissectis; caulibus 2–4.5 dm. altis; foliis caulinis 5–10; capitulis 1–5.—Gravels and sands of the St. John River and tributaries, Quebec, Maine and New Brunswick, and of the Restigouche River, New Brunswick and Quebec. TYPE: river-gravels and shingly border of thicket by the St. John River, Woodstock, New Brunswick, July 14, 1916, *Fernald & Long,* no. 14,860 (TYPE—four sheets—in Gray Herb.).

ARNICA (CORDIFOLIAE) **Whitneyi,** sp. nov. (TAB. 379, FIGS. 1–5), rhizomate gracili perlongo horizontali vel subadscendente stolonifero; caule solitario 1.7–4 dm. alto sparse villoso, pilis albidis ad 2 mm. longis glandulis minutis commixtis; foliis basilaribus late ovatis vel subrotundatis membranaceis utrinque sparse pilosis 5.5–10 cm. longis 4.5–8 cm. latis, basi valde cordatis sino angusto, margine remote

breviterque serrato-dentato, apice subacuto vel rotundato, petiolo gracile 6–12 cm. longo glanduloso-villoso; foliis caulinis 2–3-jugis, imis longe petiolatis basilares simulantibus, mediis similibus breviter petiolatis basi cordatis vel subcordatis, superioribus reductis ovatis vel lanceolatis subintegris acutis basi rotundatis sessilibus vel breve petiolatis; pedunculis 1–3 nudis vel bracteatis, bracteis lineari-lanceolatis caudato-attenuatis; capitulis 2.5–5 cm. diametro; involucro 1.2–1.8 cm. alto basi dense albido-villoso supra glanduloso laxeque villoso; bracteis 8–12 lineari-oblanceolatis 2–3 mm. latis apice deltoideo-acuminato; ligulis luteis, lamina 1.2–1.8 cm. longa 4–6 mm. lata 7–9-nervata apice breviter 3-dentata dentibus vix 1 mm. longis; corollis disci 8 mm. longis, tubo villoso 3–4 mm. longo basi obcupuliformi, cupula glabra 0.6–0.7 mm. alta; achaeniis nigris 7 mm. longis strigoso-hirsutis basi anguste albido-annulatis, annulo 0.1 mm. lato; pappo albido 8–11 mm. longo, setis barbellulatis.—Keweenaw County. MICHIGAN: Copper Harbor, 1849, *W. D. Whitney* in Gray Herb.; dry deciduous woods near Copper Harbor, July 4, 1934, *Fernald & Pease*, no. 3579 (TYPE in Gray Herb.); dry, deciduous woods at base of greenstone and calcareous conglomerate bluffs, east of Eagle Harbor, July 6, 1934, *Fernald & Pease*, no. 3580.

Arnica Whitneyi, as beautiful a plant as any in the genus, is named for its discoverer, WILLIAM DWIGHT WHITNEY, 1827–1894. In his report on Botany in Foster, J. W., and Whitney, J. D., Rep. Geol. Lake Superior Land District, ii. Chap. xxi, 368 (1851), W. D. Whitney recorded it as *A. mollis* Hook. from Copper Harbor; and his material (the upper half of a plant preserved in the Gray Herbarium) has been the basis of subsequent reports of *Arnica* from Michigan: as *A. Chamissonis* of Gray, Man. ed. 2, issue of 1859, and later eds., from Lake Superior, and of Beal & Wheeler's Michigan Flora; as *A. lanceolata* of Britton, Man. and of Beal, Flora of Michigan; as *A. cordifolia* of Fernald, RHODORA, vii. 150, from Copper Harbor (*Whitney*) and of Robinson & Fernald in Gray, Man. ed. 7; as *A. mollis* of Britton in Britton & Brown, Ill. Fl. ed. 2, from Lake Superior.

The white, merely barbellulate pappus of the fragmentary Whitney specimen clearly separates his plant from *Arnica Chamissonis* Less. and *A. mollis* Hook. (including *A. lanceolata* Nutt.) which have brownish or olivaceous plumose pappus. The beautiful new material, with characteristic basal leaves, shows that the relationship of *A. Whitneyi* is with *A. cordifolia* Hook. and its cordilleran segregates. The Keweenaw plant, however, seems very distinct from *A. cordifolia* and its described allies.

In typical *A. cordifolia* (FIGS. 6–9), as shown by an authentic specimen sent by Hooker in 1835 to Jacques Gay and now preserved

in the Gray Herbarium (Hooker had published the species in 1834) and by a large series of specimens from the cordilleran region, the basal leaves are merely cordate, subcordate or subtruncate at base, with broad and open sinuses, and the marginal teeth are very coarse; the middle and upper cauline leaves are mostly deltoid-ovate, the upper sometimes rhombic, and with prolonged tips; and the pubescence of the stem, peduncles and involucres rarely shows much of the glandular admixture which is so abundant on and which gives a heavy, oily odor to *A. Whitneyi*. In *A. cordifolia* the involucral bracts (FIG. 6) are usually more broadly oblanceolate than in *A. Whitneyi* (FIG. 2) and without the abundant glands on the surface; the ligules (FIG. 7) are broader (up to 1 cm. broad), with sharper and longer terminal lobes (the longer 1.5–3 mm. long); the disk-corollas (FIG. 8) are coarser (9–11 mm. long), the tube with a conical, rather than inverted-cuplike base; and the slightly coarser achenes (FIG. 9) have the basal annulus heavier and thicker.

These numerous characters, though largely of degree, set the Keweenaw plant off so definitely from its cordilleran allies that it seems better to treat it as a species than as an isolated variety which differs in ten or more recognizable characters. Its nearest relationship is certainly with *Arnica cordifolia;* the other recognized members of the *Cordifoliae* (all cordilleran) are more remote from it. In Keweenaw County *A. Whitneyi* was closely associated with the ubiquitous *Aster macrophyllus* L. Where the Arnica made large patches of sterile shoots with their characteristic foliage, it was necessary to exercise caution not to collect rosettes of the Aster!

In view of the discovery of *Arnica Whitneyi* in 1849 by the young botanist who then was dividing his interest between natural history and philology, later to become one of our most distinguished philologists,[1] it is most appropriate that the rediscovery of this beautiful

[1] In 1849, WILLIAM DWIGHT WHITNEY went as botanist on the Lake Superior expedition of his older brother, Josiah Dwight Whitney. "Up to this time, as has already been intimated, his interests lay mainly in the direction of the natural sciences. But an event was now about to occur which was destined to change the course of his studies and to determine his whole future. In 1847, his elder brother, Professor J. D. Whitney, had returned from Germany, where he had been devoting himself to the science [geology] in which he has become distinguished. Yet while there he had not limited his attention to it, but had given up a good deal of time to language. Among the books he brought back with him was a copy of the second edition of Bopp's Sanscrit Grammar. This work attracted the attention of his younger brother, and aroused a keener interest than he had before felt in any particular subject. In the winter of the following year he began the systematic study of Sanscrit. For him this was the parting of the ways. In June, 1849, indeed, he joined an expedition sent out by the United States government to explore the region about Lake Superior. One of its two directors was his elder brother, and to the future philologist were assigned

plant should have been shared by a later distinguished philologist, Arthur Stanley Pease, who finds his chief diversion in botany.

CIRSIUM PALUSTRE (L.) Scop. MICHIGAN: border of wet woods, Lawson, Marquette Co., no. 3582; low woods, Michigamme, no. 3583; and seen in similar habitats to Houghton Co.

Cirsium palustre in northern Michigan is either indigenous (as it appears to be in Newfoundland)[1] or, if introduced, has remarkably succeeded in selecting habitats where it simulates indigenous species. Its behavior in Michigan (whether it suddenly spreads or remains quiescent) should be watched.

KRIGIA BIFLORA (Walt.) Blake, forma **glandulifera,** f. nov., pedunculis superne glanduliferis.—With or apart from the typical glabrous-peduncled form of the species. TYPE: dry sandy spruce and pine barrens near Humboldt, Michigan, July 3, 1934, *Fernald & Pease*, no. 3584, in Gray Herb.

Typical *Krigia biflora* (Walt.) Blake, RHODORA, xvii. 135 (1915), has glabrous peduncles. So far as shown in the Gray Herbarium all the specimens from New England to West Virginia are without glands. Some from Kentucky, North Carolina and Tennessee have glandular peduncles; others, often of the identical collection (on the same sheet) are glandless. In the Great Lakes region, thence westward to Colorado, glandular peduncles occur on about one-third of the specimens in the herbarium. Here, again, glabrous and glandular peduncles are sometimes on the same sheet. All the material we saw in northern Michigan had the glands well developed. I cannot, however, look upon these plants as more than a recognizable form. They surely are not a separate species. Upon the collection of Bronson Barlow from Turin, Marquette Co., Michigan, June 21, 1901, was based *Cynthia falcata* Standley, Contrib. U. S. Nat. Herb. xiii. 356 (1911). One of the Barlow sheets is before me and I cannot separate it from much typical *Krigia biflora* except in glandular peduncles. Standley, in publishing *Cynthia falcata*, separated it solely on the "prominently aquiline-serrate upper leaves," the upper leaves of *Cynthia virginica*

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the barometrical observations, the botany, and the charge of the accounts. But he took with him also his copy of Bopp, and the leisure moments he enjoyed during the expedition were, as far as possible, devoted to the fuller study of that work."—T. R. Lounsbury, *William Dwight Whitney*, Proc. Am. Acad. xxx. 580, 581 (1895).

In view of the frequent assumptions that W. D. Whitney, botanist of the Lake Superior expedition of 1849, was really J. D. Whitney, the distinguished geologist (the "W" being considered a misprint), and since the botanical report is entered in bibliographies merely under W. D. Whitney, the above excerpt from Professor Lounsbury's sketch is quoted as satisfactorily clearing the identity.

[1] See Fernald, RHODORA, xxxv. 15 and 369 (1933).

(*Krigia biflora*) said to be entire. In his proposed new species the "fruit is as in *C. virginica* . . . A very different plant . . . , readily distinguished by the peculiar toothing of its leaves."

In the Barlow sheet in the Gray Herbarium the uppermost leaves (bracts) are entire, but the median and lower leaves have prominent divergent to curving variable teeth. Such teeth are seen on our collection from Gladstone, Michigan (*F. & P.*, no. 3585) which, accordingly, would be *Cynthia falcata*. They occur on numerous other specimens with glandular peduncles and upon many with the peduncles glabrous: from Southbury, Connecticut; Mohegan, New York; Mount Bethel, Pennsylvania; Webster Co., West Virginia; Milwaukee, Wisconsin; Rantoul, Illinois, etc. The character depended upon by Standley as his fundamental specific one is too fickle. The plants with strongly developed glands are at least recognizable and may have some ecological significance. To take up Standley's specific epithet *falcata* to designate a *glandular* form would be quite misleading and is wholly unnecessary. Similarly, to take up for a glandular form of nearly transcontinental range the name *C. viridis* Standley, l. c. 357 (1911), given to the plants of New Mexico and Arizona (occurring also in Colorado) because of a reputed greener color, would be inappropriate. Consequently, I have given a new name and have designated a different type.

EXPLANATION OF PLATES 352–380

Plates 352–354. Sufficiently explained in the legends.

Plate 355. Phyllitis Scolopendrium (L.) Newm.: fig. 1, frond, × ½, from Larmor's Glen, Dundonald, Ireland, August 12, 1884, *R. L. Praeger;* fig. 3, portion of stipe, × 10, from Ennis, Co. Clare, Ireland, *Tidestrom*, no. 11,256; fig. 5, margin of fond, × 10, from Savoy, ex herb. Thurber.

P. Scolopendrium var. americana, n. var.: fig. 2, frond, × ½, from Perryville, Madison Co., New York, August, 1903, *House;* fig 4, portion of stipe, × 10, from Ingalls Falls, Grey Co., Ontario, *Fernald*, no. 3040 (type); fig. 6, margin of frond, × 10, from White Lake, east of Jamesville, New York, *Wiegand*, no. 5374.

Plate 356. Cryptogramma crispa (L.) R. Br., var. acrostichoides (R. Br.) C. B. Clarke: reproduction of original plate of *C. acrostichoides* in Hooker & Greville, Icones Filicum, i. t. xxix.

Plate 357. Cryptogramma crispa, var. Brunoniana (Wallich) Fern.: reproduction of original plate of *C. Brunoniana* in Hooker & Greville, Icones Filicum, ii. t. clviii.

Plate 358. Pteridium aquilinum (L.) Kuhn, var. lanuginosum (Bong.) Fern., forma decipiens (Lawson) Fern.: portion of plant, × ⅗, from Caribou Hill, Black Lake, Megantic Co., Quebec, *Fernald & Jackson*, no 11,961.

Plate 359. Festuca ovina L.: fig. 1, panicle, × 1, from Glåmos, Norway, 1925, *Dyring;* fig. 2, spikelet, showing anthers, × 5, from Forked River, New Jersey, May 27, 1891, *J. R. Churchill.*

F. ovina, var. duriuscula (L.) Koch: fig. 3, pancile, × 1, from Cambridge,

Massachusetts, June 8, 1884, *Walter Deane;* FIG. 4, spikelet, showing anthers, × 5, from Albany, New York, June 6, 1912, *S. H. Burnham.*

F. SAXIMONTANA Rydb.: FIG. 5, panicle, × 1, from Jack Fish, Thunder Bay Distr., Ontario, *Pease & Bean*, no. 23,332; FIG. 6, spikelet, showing anthers, × 5, from no. 23,332.

F. BRACHYPHYLLA Schultes: FIG. 7, panicle, × 1, from Craig Harbor, Ellesmere Island, *Malte*, no. 118,370; FIG. 8, spikelet, showing small anther, × 5, from Craig Harbor, Ellesmere Island, *Malte*, no. 118,372.

F. SUPINA Schur: FIG. 9, spikelet, showing anthers, × 5, from Petrak, Fl. Bohem. et Morav. Exsicc. no. 717.

F. VIVIPARA (L.) Sm.: FIG. 10, panicle, × 1, from Little Quirpon, Newfoundland, *Wiegand, Gilbert & Hotchkiss*, no. 27,385; FIG. 11, spikelet, showing awnless lemmas, × 5, from no. 27,385.

F. CAPILLATA DC.: FIG. 12, panicle, × 1, from Grand Falls, Newfoundland, *Fernald & Wiegand*, no. 4669; FIG. 13, spikelet, showing anthers, × 5, from Murray's Pond, Newfoundland, 1931, *A. M. Ayre.*

PLATE 360. CAREX GARBERI, n. sp.: FIG. 1, small plant, × 1, from Manistique, Michigan, *Fernald & Pease*, no. 3183; FIG. 2, orifice of sheath, × 5, from no. 3183; FIG. 3, spike, showing obtuse scales, × 5, from no 3183; FIG 4, staminate base of terminal spike, showing obtuse scales, × 5, from Presque Isle, Pennsylvania, June 9, 1869, *Garber* (ISOTYPE); FIG. 5, denuded rachis, × 10, from *Fernald & Pease*, no. 3183; FIG. 6, perigynium, × 10, from ISOTYPE.

C. GARBERI, var. BIFARIA, n. var.: FIG. 11, portion of plant, × 1, from River Ste. Anne des Monts, Quebec, August 3–17, 1905, *Collins & Fernald* (TYPE); FIG. 12, perigynium, × 10, from TYPE.

C. HASSEI Bailey: FIG. 7, portion of spike, showing sharp scales, × 5, from San Bernardino, California, *S. B. Parish*, no. 5219; FIG. 8, staminate base of terminal spike, showing large, acute scales, × 5, from no. 5219; FIG. 9, orifice of sheath, × 5, from no. 5219.

C. AUREA Nutt.: FIG. 10, portion of spike, to show distant flowers, × 5, from Charlotte, Vermont, June 12, 1878, *F. H. Horsford.*

PLATE 361. ZIGADENUS GLAUCUS Nutt.: FIG. 1, flowering plant, × ⅖, from Scotty Bay, Mackinac Co., Michigan, *Ehlers*, no. 648; FIG. 2, portion of inflorescence, showing firm bracts, × 2, from L'Anse Pleureuse, Gaspé Co., Quebec, *Kelsey & Jordan*, no. 55; FIG. 3, capsule, × 2, from Cap Blanc, Percé, Quebec, *Collins, Fernald & Pease* (*Pease*, no. 5567).

Z. ELEGANS Pursh: FIG. 4, flowering plant, × ⅖, from mountains (at 10,500 ft.) near Cottonwood Lake, Lincoln Co., Wyoming, *Payson & Armstrong*, no. 3774; FIG. 5, portion of inflorescence, showing scarious bracts, × 2, from Leeds, North Dakota, July 3, 1899, *Lunell;* FIG. 6, capsule, × 2, from French Creek, Albany Co., Wyoming, *Goodding*, no. 2036.

PLATE 362. RIBES CYNOSBATI L.: FIG. 2, fruiting branch, × 1, from Stowe, Vermont, July 8, 1908, *R. W. Woodward.*

R. CYNOSBATI, var. ATROX, n. var.: FIG. 1, fruiting branch, × 1, from Little Current, Manitoulin Island, Ontario, *Fernald & Pease*, no. 3358 (TYPE).

PLATE 363. RUBUS PARVIFLORUS Nutt., × 1/10, in border of mixed woods, Bête Grise, Keweenaw Co., Michigan.

PLATE 364. RUBUS PARVIFLORUS Nutt., var. GENUINUS: FIG. 1, young calyx, × 10, and FIG. 2, portion of mature sepal, × 10, showing the long villosity hiding the glands, from Mackinac Island (type-locality), Michigan, July 1881, *T. E. Boyce.*

Var. VELUTINUS (Hook. & Arn.) Greene: FIG. 3, peduncle, × 10, from California, *Ross*, and FIG. 4, lower surface of young leaf, × 10, to show the dense villosity, from California, *Thos. Coulter*, no. 147.

Var. HYPOMALACUS, n. var.: FIG. 5, lower surface of leaf, × 10, showing characteristic pubescence, from Olympic Mts., Washington, *J. M. Grant*, no. 211 (TYPE). NOTE: The pubescence of var. *bifarius* is similar.

Var. HETERADENIUS, n. var.: FIG. 6, portion of pedicel and calyx, × 10, showing the long glands, from near Victoria, British Columbia, June, 1896, *C. E. Cummings.* NOTE: The pedicel and calyx of var. *hypomalacus* are

similar. Fig. 7, lower surface of leaf, × 10, from Falcon Valley, Washington, *Suksdorf*, no. 1758 (type). Note: The lower surfaces in vars. *grandiflorus* and *scopulorum* are similar.

Plate 365. Rubus parviflorus Nutt., var. grandiflorus Farwell: fig. 4, portion of pedicel and calyx, × 10, showing glandularity intermediate between that of vars. *heteradenius* and *scopulorum*, from Lead City, South Dakota, *Rydberg*, no. 655. Note: The pedicels and calyx of var. *bifarius* are similar.

Var. scopulorum (Greene) Fern.: fig. 5, pedicel, × 10, showing the very abbreviated glands, from La Plata Cañon, Colorado, *Baker, Earle & Tracy*, no. 680.

Var. parvifolius (Gray) Fern.: fig. 1, two plants, × ⅖, from Pecos River National Park, New Mexico, *Standley*, no. 4032; fig. 2, calyx and summit of pedicel, × 10, showing essential lack of glands, from Santa Fé Creek, New Mexico, *Fendler*, no. 208 (type): fig. 3, lower surface of leaf, × 10, showing reduction of pubescence, from the type.

Plate 366. Chamaerhodos Nuttallii Pickering, var. keweenawensis, n. var.: fig. 1, plant, × 1, of type-collection, West Bluff, Keweenaw Co., Michigan, *Fernald & Pease*, no. 3376; fig. 2, branch, × 10, showing pubescence, from type.

C. Nuttallii: fig. 3, branch, × 10, to show pubescence, from type-locality, Mandan, North Dakota, June 23, 1912, *O. A. Stevens.*

Plate 367. Potentilla fruticosa L., forma villosissima, n. f.: fig. 1, fruiting branch, × 1; fig. 2, leafy branch, × 1; fig. 3, branchlet, × 3; all from Great Cloche Island, Ontario, *Fernald & Pease*, no. 3382 (type).

Plate 368. Geum virginianum L.: type (plant of *Hortus Upsaliensis* in Herb. Linnaeus). Photograph from Mr. S. Savage, Assistant Secretary, Linnean Society of London.

Plate 369. Geum aleppicum Jacq.: reproduction from Jacquin, Ic. Pl. Rar. i. t. 93.

Plate 370. Geum aleppicum Jacq.: fig. 2, portion of fruiting head, showing villous achenes, × 4, from Nízké, Tatry Mts., Slovakia, *Domin & Krajina*, Fl. Cechoslov. Exsicc., no. 272; fig. 3, achene, × 10, from Lyck, East Prussia, July 1, 1858, *C. Sania.*

G. aleppicum, var. strictum (Ait.) Fern.: fig. 1, small fruiting plant, showing variation of basal leaves, × ⅖, from Willoughby, Vermont, July 18, 1896, *E. F. Williams;* fig. 4, portion of fruiting head, showing sparsely pubescent achenes, × 4, from Kidstone Island, Nova Scotia, *Fernald & Long*, no. 21,521; fig. 5, achene, × 10, from Richmond, New Hampshire, September 8, 1926, *C. F. Batchelder.*

Plate 371. Geranium dissectum L.: fig. 1, calyx, × 5, of *G. laxum* Hanks, from Friday Harbor, San Juan Islands, Washington, *Zeller*, no. 834; fig. 2, carpel-body, × 5, from Biltmore, North Carolina, *Biltmore Herb.*, no. 4868; fig. 3, seed, × 10, from Tyrone, Ireland, 1896, *Leebody;* fig. 4, seed, × 10, of *G. laxum* Hanks, from near Milwaukie, Oregon, *Suksdorf*, no. 2450; fig. 5, seed, × 10, from *Biltmore Herb*, no. 4868; fig. 6, surface of seed, × 50, from Tyrone, Ireland, *Leebody;* fig. 7, surface of seed, × 50, of *G. laxum* Hanks, from *Suksdorf*, no. 2450.

G. Bicknellii Britton: fig. 8, calyx, × 5, from Bathurst, New Brunswick, July 25, 1902, *Williams & Fernald;* fig. 9, seed, × 10, from West Roxbury, Massachusetts, *Floyd*, no. 1041; fig. 10, seed, × 10, from Sorrento, Maine, July 27, 1889, *G. G. Kennedy;* fig. 11, surface of seed, × 50, from Sorrento.

G. Bicknellii, var. longipes (Wats.) Fern.: fig. 12, calyx, × 5, from Seely Lake, Montana, *Kirkwood*, no. 1836; fig. 13, peduncle and pedicel, × 10, from type, Washatch Mts., Utah, *Watson*, no. 206; fig. 14, peduncle and pedicel, × 10, from isotype of *G. nemorale* Suksdorf, West Klickitat Co., Washington, *Suksdorf*, no. 2058; fig. 15, carpel-body, × 5, from Ione, Washington, *Kreager*, no. 406; fig. 16, seed, × 10, from Washington, *G. R. Vasey*, no 217; fig. 17, seed, × 10, from Blue Mts., Walla Walla Co., Washington, August 2, 1896, *Piper;* fig. 18, surface of seed, × 50, from last specimen.

PLATE 372. GERANIUM SPHAEROSPERMUM, n. sp.: FIG. 1, portion of fruiting plant, × 1, from TYPE, Great Cloche Island, Ontario, *Fernald & Pease*, no. 3405; FIG. 2, calyx, × 5, from TYPE; FIG. 3, carpel-body, × 10, from TYPE; FIG. 4, seed, × 10, from TYPE; FIG. 5, surface of seed, × 50, from TYPE.

G. TEXANUM (Trel.) Heller; FIG. 6, calyx, × 5, from TYPE, New Braunfels, Texas, *Lindheimer;* FIG. 7, carpel-body, × 10, from Corpus Christi, Texas, *Tracy*, no. 9215; FIG. 8, seed, × 10, from no. 9215; FIG. 9, seed, × 10, from TYPE; FIG. 10, surface of seed, × 50, from TYPE.

PLATE 373. GERANIUM CAROLINIANUM L.: Copied (reduced) from Dillenius, Hort. Elth. t. 135.

PLATE 374. GERANIUM CAROLINIANUM L., var. CONFERTIFLORUM, n. var.: FIG. 1, portion of fruiting plant, × 1, from TYPE, North Amherst, Ohio, *R. J. Webb*, no. 5263; FIG. 6, calyx, × 5, from Alexandria, Virginia, *Wiegand & Manning*, no. 1692; FIG. 2, carpel-body, × 10, from Warwick, Rhode Island, June 25, 1910, *Fernald;* FIG. 3, seed, × 10, from TYPE; FIG. 4, seed, × 10, from New Bedford, Massachusetts, *E. W. Hervey;* FIG. 5, surface of seed, × 50, from TYPE.

G. CAROLINIANUM L.: FIG. 7, seed, × 10, of *G. Langloisii* Greene, from Gretna, Louisiana, *Ball.* no. 301; FIG. 8, surface of seed, × 50, from no. 301.

PLATE 375. VIOLA SEPTENTRIONALIS, var. GRISEA, n. var.: FIG. 1, fruiting plant, × 1, from Driggs, Michigan, *Fernald & Pease*, no. 3430 (TYPE); FIG. 2, base of expanding leaf, × 10, from TYPE; FIG. 3, cleistogamous fruit, to show ciliate auricles of sepals, × 10, from TYPE.

PLATE 376. LITHOSPERMUM CROCEUM, n. sp.: FIG. 1, small flowering plant, × ½, from east of Manistique, Michigan, *Fernald & Pease*, no. 3494 (TYPE); FIG. 2, fruiting stem, × ½, from Topeka, Illinois, August 22, 1904, *Gleason;* FIG. 3, back of bract, showing characteristic pubescence, × 10, from Pelee Island, Ontario, August 20, 1914, *MacDaniels & Eames;* FIG. 4, fruiting calyx, showing prominent costa, × 4, from Southampton, Ontario, *Macoun*, no. 54,342; FIG. 5, portion from summit of tube and base of corolla-lobe, to show characteristic reticulate venation, × 10, from TYPE.

L. CAROLINIENSE (Walt.) MacM.: FIG. 6, back of bract, showing characteristic pubescence, × 10, from Columbia, South Carolina, *Canby*, no. 75; FIG. 7, fruiting calyx, showing flat sepals, × 4, from near Antlers, Pushmatah Co., Oklahoma, *E. J. Palmer*, no. 39,403; FIG. 8, portion from summit of tube and base of corolla-lobe to show characteristic non-reticulate venation, × 10, from *Canby*, no. 75.

PLATE 377. TANACETUM HURONENSE Nutt., var. TYPICUM: FIG. 1, flowering stem and basal leaf, × ⅖, from Manistique, Michigan, *Fernald & Pease*, no. 3567; FIG. 2, achene, × 10, from Lake Superior, *Loring*.

Var. BIFARIUM, n. var.: FIG. 3, flowering plant, × ⅖, from Rivière McKane, Ile d'Anticosti, Quebec, *Victorin & Rolland*, no. 27,564 (TYPE); FIG. 4, basal leaves, × ⅖, from Rivière des Caps, Anticosti, *Victorin & Rolland*, no. 27,566.

PLATE 378. TANACETUM HURONENSE Nutt., var. TERRAE-NOVAE Fern.: FIGS. 1–3, flowering plants, × ⅖, from St. John Island, Newfoundland, *Fernald et al.*, no. 29,201; FIG. 4, achene, × 10, from Sandy Cove, Ingornachoix Bay, Newfoundland, *Fernald, Long & Dunbar*, no. 27,157.

Var. JOHANNENSE, n. var.: FIG. 5, flowering branch, × ⅖, from St. John River, Westfield, New Brunswick, *Fernald*, no. 2262; FIG. 6, achene, × 10, from St. John River, Woodstock, New Brunswick, *Fernald & Long*, no. 14,860.

PLATE 379. ARNICA WHITNEYI, n. sp.: FIG. 1, small flowering plant and basal rosette, × ⅖, from Copper Harbor, Michigan, *Fernald & Pease*, no. 3579 (TYPE); FIG. 2, portion of involucre, × 2, from Eagle Harbor, Michigan, no. 3580; FIG. 3, tip of ligule, × 2, from TYPE; FIG. 4, disk-corolla, × 5, from TYPE; FIG. 5, achene, × 5, from TYPE.

A. CORDIFOLIA Hook.: FIG. 6, portion of involucre, × 2, from Carson, Colorado, *C. F. Baker*, no. 312; FIG. 7, tip of ligule, × 2, from Druid Peak, Yellowstone National Park, *Nelson & Nelson*, no. 5805; FIG. 8, disk-corolla, × 5, from Pyramid Lake, Jasper Park, Alberta, *J. M. Macoun*, no. 96,019; FIG. 9, achene, × 5, from Ross Hole, Montana, *S. Watson*, no. 232.

THE SPORES OF THE GENUS SELAGINELLA IN NORTH CENTRAL AND NORTH EASTERN UNITED STATES

R. M. Reeve

(Plates 380 and 381)

That spores of Pteridophytes may be used in the identification of species is illustrated in the genus *Isoetes*[1] and in the genus *Lycopodium*.[2] It is also apparent that the spores of the genus *Selaginella* likewise show specific characters.

The spores were obtained from herbarium specimens from various parts of the United States. The preparation of the material consisted of soaking the specimens in warm water to facilitate removal of the sporangia; boiling the spores for a few seconds in 10% KOH on a slide; washing a number of times in distilled water; and mounting in glycerine jelly. In some cases the spores were heated in water in a watch glass over a beaker of boiling water; glycerine jelly containing a stain was then added and evaporated to the desired consistency for mounting. The KOH was used to clear the spores so that the exine features would be more distinct. Staining with methyl green in glycerine jelly was found to be very satisfactory. The use of safranine used after the KOH treatment was also a good method providing the spores were left in the stain for only a few seconds. In some cases staining was unnecessary.

The spores were examined under a compound microscope using a 7.5 × ocular and the 4 mm and 16 mm objectives for the micro- and megaspores respectively. The outlines of the surface features were traced with the aid of a camera lucida. The apical surface is that upon which the germinating slits are found, and the basal surface (more or less dome-shaped) is the opposite surface. With the exception of *Selaginella rupestris*, the drawings are of these two surfaces for both micro- and megaspores. In that species, however, the apical surface as it appears for the spores of the other species is absent and the drawings were made of the two types found. A slight variation in size, shape, and pattern of the spores occurs, due to age, condition, and treatment of the specimens; but the distinguishing characters are quite readily found. Many spores of each species were examined and typical individuals were chosen for the drawings.

[1] Gray's Manual, 7th Edition. A. A. Eaton.
[2] Wilson, L. R. 1934. Spores of the genus *Lycopodium* in the United States and Canada. Rhodora. 36: 13–19.

The species here treated are *S. selaginoides, S. apoda, S. rupestris,* and *S. densa.* These four species show unmistakable characters in the ornamentation of both micro- and megaspores.

In *S. selaginoides* the microspores are spinose on the basal side, each having twenty-five to thirty-two blunt spines which are nearly flat across the point and average 8 mu in length (Plate 380). The apical surface is smooth and the germinating slits are on prominently raised ridges, each of which extends nearly the full radius of the spore. The spores themselves are very slightly triangular in outline, and measure from 32 to 38 mu in diameter exclusive of the spines.

The megaspores of this species are large, ranging from 580 to 600 mu in diameter, and appearing pale yellow and about one-third the size of a pin-head to the naked eye. The exine is distinctly papillate on both the apical and basal surfaces. The numerous papillae are from 3 to 3.5 mu in width, and from 5 to 7 mu in length (Plate 381). In both micro- and megaspores the apical surface is similar to a flattened pyramid, the basal surface like a more or less flattened dome.

The microspores of *S. apoda* are the smallest of any of the four species, ranging from 24 to 27 mu in diameter (Plate 380). Both the apical and the basal surfaces are marked by small, dome-like ridges averaging about 3 mu across, so that the spore coat sometimes appears to be pitted. The germinating slits are prominent.

The megaspores are likewise the smallest of the four species, ranging from 330 to 370 mu in diameter (Plate 381). The basal surface is marked by ridges of reticulation which range from 25 to 50 mu in distance apart. Many of these ridges lower into the general level of the spore coat; and around the edge of the spore the ridges appear as a folded, translucent margin. On the apical surface the reticulation fades into wrinkles and folds in the exine near the edge. The central portion of the apical surface is relatively smooth, marked by only a few minor wrinkles. The germinating slits are on a prominent ridge. Both the micro- and megaspores are nearly circular in outline and appear to be slightly more spherical than those of *S. selaginoides.*

The spores of *S. rupestris* show distinctly different characters from those of the other three species. Both micro- and megaspores vary considerably in size, and "dumb-bell" spores are quite common, occurring one in every thirty or forty spores. The single microspores are from 45 to 60 mu in diameter and are marked by wrinkles which vary from few to many on the spore coat (Plate 380). The single megaspores range from 300 to 500 mu in diameter and are

heavily reticulate (Plate 381). The ridges of reticulation are drawn into a disconcentric ring of papillae-like ends where the spores were attached previous to division. Both micro- and megaspores are more or less spherical and are without an apical surface such as is found on the spores of the other species, indicating that they occur from a diad formation. The "dumb-bell" spores in each case have smaller diameters at each end than the diameters of the single spores.

In none of the *S. rupestris* material examined were tetrads of spores found, or was there any indication of an apical surface as is typical of the spores formed from tetrad division. Miss Mitchell[1] states that *S. rupestris* was found to have several cases of inequality in the size of the spores, and that "in *S. rupestris* there are normally two spores" in the megasporangium, and that sometimes one megaspore of correspondingly large size was found. Miss Lyon[2] figures the "dumb-bell" spores of *S. rupestris*, but fails to describe any differences in the appearance of spores found in megasporangia containing more than two spores, and whether or not they had germinating slits. Sterile spores have been known to be common in this species, and the variability in size, and the presence of "dumb-bell" spores is indicative of hybridization.[3]

In *S. densa* the diameter of the microspores is from 37 to 42 mu. The basal surface is papillose, the tiny papillae appearing only about one micron in width and not profuse. The apical surface is not definitely ornamented and the germinating slits are on a prominent ridge (Plate 380).

The megasporangia of this species are heavily reticulate on both the basal and the apical surfaces, the reticulation on the apical surface being much closer and the ridges appearing folded together near the germinating slits, sometimes running into the ridge of the germinating slit. The diameter of the megaspores ranges from 350 to 390 mu (Plate 381).

Like *S. apoda*, the reticulation at the edge appears as a folded translucent margin; however, there are considerably fewer ridges which lower to the general level of the exine. The ridges of reticulation on *S. densa* range from 20 to 30 mu apart on the basal surface and slightly closer together on the apical surface. The spores of *S. densa*

[1] Mitchell, G. 1910. Contributions towards a knowledge of the Anatomy of the genus *Selaginella*, Spr. V. The Strobilus. Ann. of Bot. V. XXIV.

[2] Lyon, F. M. 1901. A study of the sporangia and gametophytes of *Selaginella apus* and *Selaginella rupestris*. Bot. Gaz. V. XXXII. 124–141, 170–194.

[3] Graustein, J. E. 1930. Evidences of Hybridization in *Selaginella*. Bot. Gaz. V. XC. 46–74.

appear even slightly more spherical than those of the first two species.

Some authors reduce *S. densa* to a variety of *S. rupestris;* however, its constant vegetative and spore characters would indicate that it is a distinct species. In no cases were the spores found to vary from tetrad formation in *S. densa.* Further work on the *S. rupestris* group is now in progress.

The writer is deeply indebted to Prof. L. R. Wilson for aid, criticism, and the suggestion of the problem; and he also wishes to express his thanks to the following for specimens which they kindly supplied: Dr. H. S. Conard, Dr. J. H. Ehlers, Mr. Albert M. Fuller, Dr. George B. Rigg, and Mr. J. W. Thompson,

Coe College, Cedar Rapids, Iowa.

THE GENUS NAJAS IN MINNESOTA

C. O. Rosendahl and F. K. Butters

(Plate 382)

Three species of *Najas* have hitherto been recorded for Minnesota. These are *N. marina*, *N. guadalupensis*, and *N. flexilis*. The first named species is represented in the University herbarium by only two collections, one from Lake Minnewashta in Pope County, the other from Big Stone Lake on the western border. Both are fresh water lakes. *N. guadalupensis* is likewise known from only two stations, one at Winona, the other in Jefferson Township, Houston County, in the extreme southeastern corner of the state. The two species are obviously rare within our borders, but undoubtedly more careful search in the respective areas would locate more stations. *N. flexilis*, on the other hand, is very generally distributed throughout the entire state except in the northeastern corner, and in many of our lakes it is one of the most abundant species of aquatic plants. It is quite variable as regards size and habit of growth, ranging from small tufted forms 2–3 inches high on sandy or rocky bottoms in shallow water to long stringy plants 3–4 feet long, rooting in the muck at depths of 4–8 feet. In addition to vegetative differences, there is considerable variation in the form and size of the seed, but whether these variants can be referred to some of the subspecific segregates that have already been described or whether they represent new varieties or forms can be determined only by more detailed investigation.

Our preliminary work has, however, resulted in two noteworthy additions to the known Naiad flora of Minnesota. First, the undoubted occurrence in the vicinity of the Twin Cities of the local and apparently rare *N. gracillima*, and, second, the discovery of an entirely distinct and undescribed species from a lake in Kandiyohi County near the middle of the state. The former was found mixed with a collection of *N. flexilis* (*Rosendahl* No. 5509, Oct. 1927) from a small pond in northwestern Ramsey County, about 5 miles north of Minneapolis. The distribution of *N. gracillima* is given in Gray's New Manual (7th Ed.) as "e. Mass. to e. N. Y., N. J., and Pa.; Mo." Since then, Dr. Fernald[1] has questioned the authenticity of its reputed occurrence in Missouri and has shown that in all probability the report was based on the misreading of the label on a sheet in Engelmann's Herbarium. He calls attention to the fact that the species is localized, occurring in muddy, peaty, or sandy ponds or pools from southern N. J. and eastern Pa. northeastward near the coast to Knox County, Me., and up the Hudson River Valley to Saratoga County. Very recently, however, Dr. Fassett[2] has reported the species from three stations in Wisconsin, two of which are situated along the middle eastern border of the Driftless Area and the third in Sawyer County some distance to the northwestward. The station for *N. gracillima* in Minnesota is situated in an area of sandy plains and low morainic ridges, throughout which occurs a considerable number of the so-called Atlantic Coastal Plain species. The explanation of its disrupted range, *i. e.* Atlantic Coast from Knox County, Me., to eastern Pa. and eastern New York and in ponds of the acid, sandy areas of western Wisconsin and eastern Minnesota, is obviously linked up with the larger problem of the isolated presence of characteristic elements of the Atlantic Coastal Plain flora near the middle interior of the continent.

The new species of *Najas* referred to above was discovered in the course of a field excursion undertaken in September, 1933. The plant at once attracted attention because of its very different appearance from the ubiquitous *N. flexilis*. In fact, when first seen through the water, it was suspected of being *N. marina*, but an examination of the leaves soon revealed that they lacked the characteristically wavy-toothed margin and spiny midrib of that species. Closer study in the laboratory brought out the fact that it was entirely distinct from the

[1] Fernald, RHODORA **25**: 105. 1925.
[2] Fassett, RHODORA **36**: 149. 1934.

other species recorded for the state and further that it could not be referred to any of the species treated in the latest monograph of the genus.

In the material collected in 1933, no staminate flowers could be found. Accordingly, the description and publication of the species was deferred with the expectation of securing more adequate specimens the following season, and the station was revisited last September. Although it happened to be a very stormy day and the water was roiled to such an extent that it was impossible to see the lake bottom, after a considerable amount of blind fishing with a garden rake, we finally procured a few plants that contained the desired staminate flowers.

Najas **olivacea**, n. sp. (tab. 00). Planta densa olivacea monoeca ramis ad 25 cm. longis 1–1.5 mm. latis inferne repentibus ad nodos radicantibus superne prostratis vel ascendentibus crebro furcatis, internodiis inferioribus 2–3 cm. longis, his superioribus brevioribus; foliis lineari-lanceolatis apicem versus subacutum angustatis 9–18 mm. longis 1.5–2 mm. latis serrulatis 20–40 spinulis minutis in latere singulo, vaginis declivibus 2.5–3.4 mm. latis in latere singulo 4–8 spinulis munitis; floribus solitariis, masculis spatha ovoidea 2.5 mm. longa spinulas 3–5 apicem versus ferente, anthera quadri-loculari circa 1 mm. longa, 0.7–0.8 mm. lata, filamento crasso; floribus femineis nudis, 2.8 mm. longis, ovario vix crassiore quam stylo stigmatibus binis subulatis atque processubus binis spiniferis instructo; seminibus ellipsoidalibus leviter falcatis atque compressis 2.3–2.5 mm. longis flavescentibus levibus sed haud politis areolas plurimas subsexangulares permonstrantibus his mediis paulum transversim elongatis 87 x 125 μ, illis fines seminis versus minoribus vix elongatis; testa e stratis cellularum tribus composita, cellulis extimis (areolis) majusculis parietibus percrassis (39 μ), eis strati medii magis minoribus parietibus crassiusculis, eis strati intimi paullis depressis parietibus tenuibus.

Plants monoecious, olive-green, of bushy habit, shoots repent towards the base and freely rooting at the nodes, spreading to ascending and dichotomously much-branched, up to 25 cm. long, 1–1½ mm. thick (living), lower internodes 2–3 cm. long, gradually shortening towards the ends of the branches; leaves 9–18 mm. long, linear-lanceolate, 1.5–2 mm. wide at the top of the sheath, gradually tapering to the sub-acute apex, with 20 to 40 minute marginal spines on each side; sheaths 2.5–3.4 mm. wide, each margin with 4–8 spines (sheath of upper leaf at each node regularly wider than that of the lower).

Spathe with enclosed staminate flower narrowly ovoid, 2.5 mm. long, bearing 3–5 minute spines at the apex; anther quadrilocular, about 1 mm. long, 0.7 to 0.8 mm. wide, filament stout: pistillate flower 2.8 mm. long, ovary only slightly thicker than the style, stigmas 2, tapering, alternating with 2 slightly longer, spine-tipped

processes; pericarp purple-tinged, seeds ellipsoidal, slightly falcate and flattened, 2.3–2.5 mm. long, pale yellow, smooth but not lustrous, areolae conspicuous under a lens, those of the middle portion of the seed largest, averaging 87 x 125 μ, their longest diameter transverse to the axis of the seed, those towards the ends of the seeds somewhat smaller and more nearly isodiametric; seed coat consisting of three layers of cells, those of the outer layer—the areolae—with very thick, minutely pitted walls (averaging 39 μ thick), cells of the middle layer much smaller and with moderately thickened walls, those of the inner layer thin-walled and flat.

Growing in 1–3 feet of water, on muddy bottom, Norway Lake, Kandiyohi County, Minnesota. TYPE (*Rosendahl and Butters* No. 6446, Sept. 6, 1933) in the Herbarium of the University of Minnesota.

The species belongs to the Section *Americanae* of which the only other known representatives in the United States are *Najas flexilis* and *Najas guadalupensis*. It is readily distinguished from the former by the olive-green color, the more spreading habit of growth, the wider and shorter leaves, but especially by the quadrilocular anther and the non-lustrous, blunter, slightly falcate seeds with much larger, thicker-walled areolae. In *N. flexilis* the areolae are inconspicuous under a hand lens, and in the middle portion of the seed average 67 x 41 μ, with the longer axis parallel to the long axis of the seed. In *N. olivacea* the areolae are very conspicuous under low magnification, and in the corresponding area of the seed average 125 x 87 μ, with the longer axis transverse to the long axis of the seed. In the former the walls of the areolae average 23 μ thick, while in the latter they are 39 μ and more finely and evenly pitted.

From *N. guadalupensis*, *N. olivacea* differs in its much stouter habit, larger seeds, and especially in the structure of the testa. In *N. guadalupensis* the cells of the outer layer of the testa are large and very thin-walled, collapsing at length upon the thick-walled middle layer to produce shallow pits on the surface of the ripe seed.

UNIVERSITY OF MINNESOTA.

EXPLANATION OF PLATE

NAJAS OLIVACEA n. sp. FIG. 1, part of branching shoot × 1.2; FIG. 2, lower leaf; FIG. 3, upper leaf from same node × 3; FIG. 4, margin of leaf showing one-celled spines × 67; FIG. 5, young pistillate flower × 15; FIG. 6, one stigma lobe with adjoining sterile process × 67; FIG. 7, staminate flower, with enclosing spathe × 15; FIG. 8, mature fruit × 15; FIG. 9, ripe seed × 17; FIG. 10, epidermal cells of testa (areolae) from near the middle of the seed × 54; FIG. 11, cross section of testa × 160.

Volume 37, no. 440, including pages 269–308 and plates 363–375, was issued 1 August, 1935.

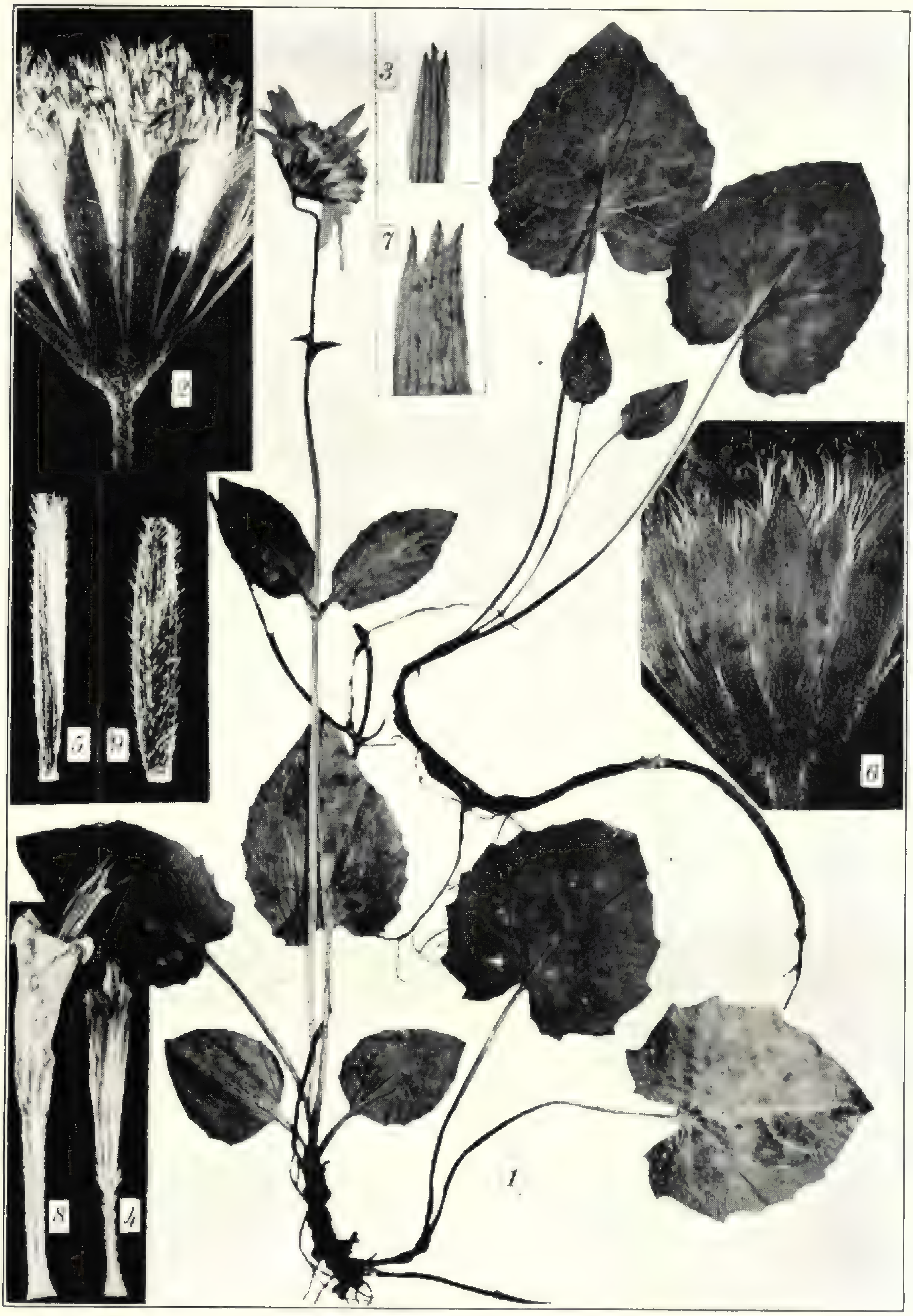
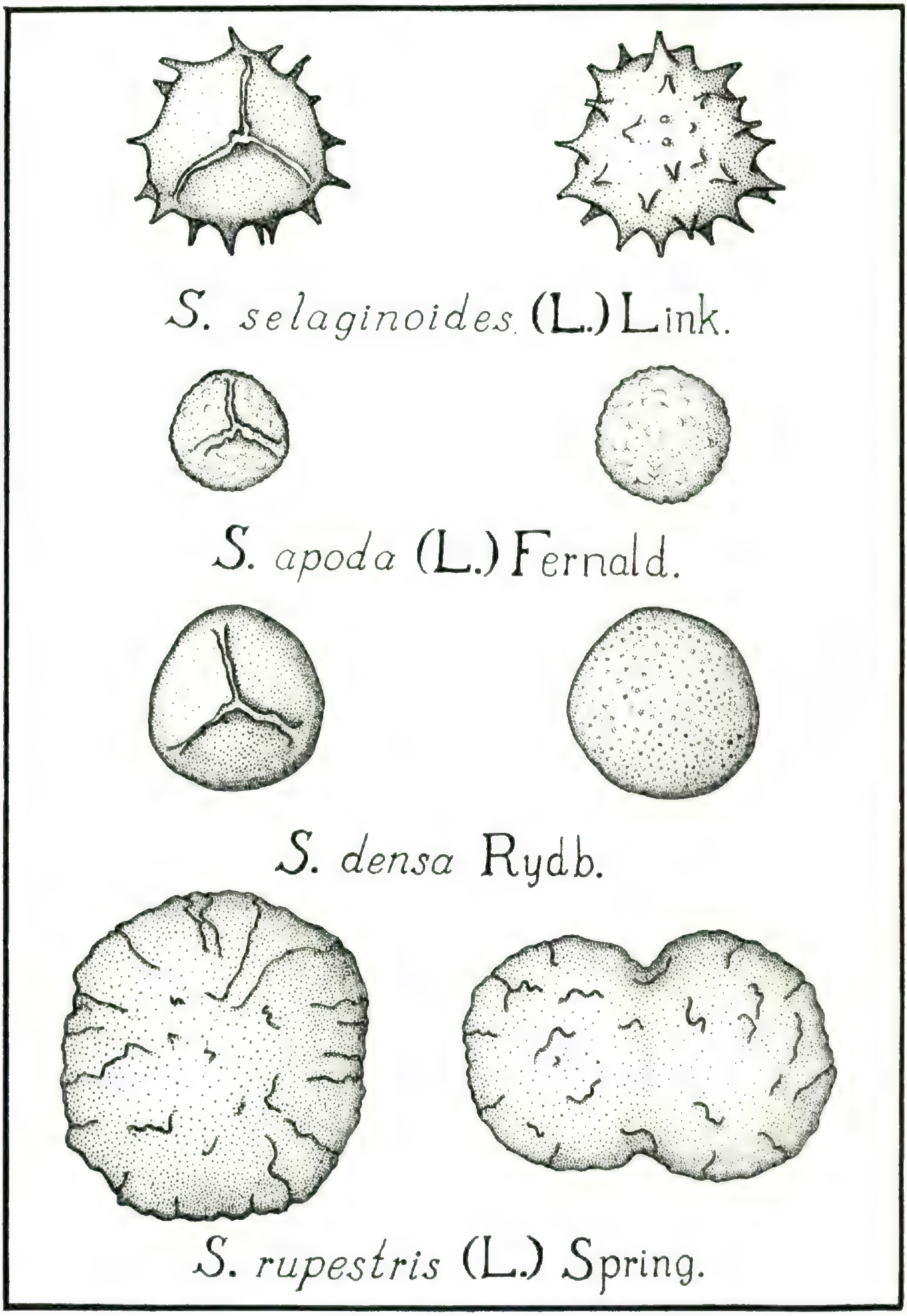


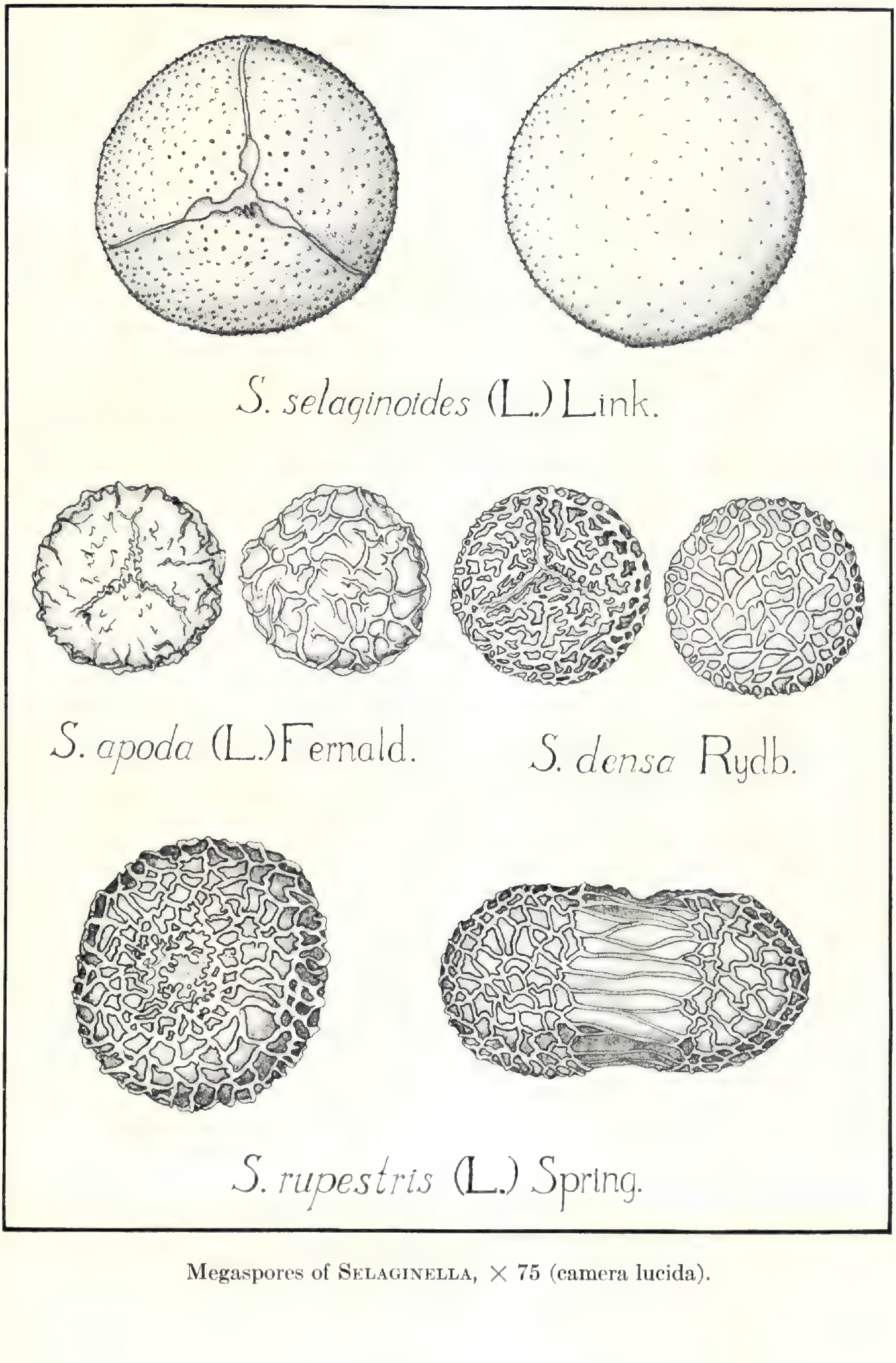
Photo. E. C. Ogden.

ARNICA WHITNEYI: FIG. 1, small flowering plant and basal rosette, × $\frac{2}{5}$; FIG. 2, portion of involucre, × 2; FIG. 3, tip of ligule, × 2; FIG. 4, disk-corolla, × 5; FIG. 5, achene, × 5; all from Michigan (TYPE).

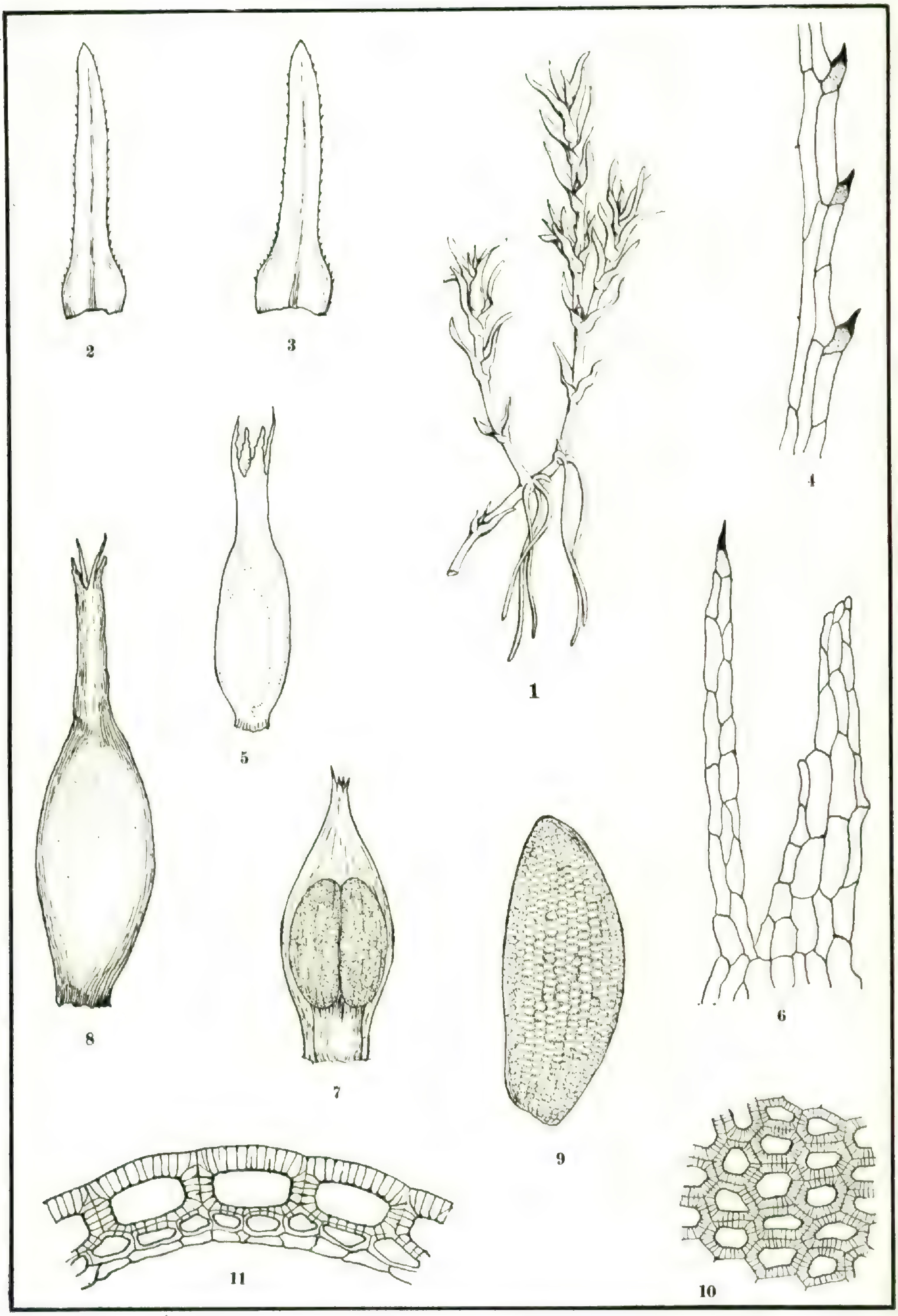
A. CORDIFOLIA: FIG. 6, portion of involucre, × 2, from Colorado; FIG. 7, tip of ligule, × 2, from Wyoming; FIG. 8, disk-corolla, × 5, from Alberta: FIG. 9, achene, × 5, from Montana.



Microspores of SELAGINELLA, × 750 (camera lucida).



Megaspores of SELAGINELLA, × 75 (camera lucida).



NAJAS OLIVACEA, n. sp.

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AFFINITIES OF THE FLORA OF THE ILLINOIAN TILL PLAIN OF SOUTHWESTERN OHIO[1]

E. Lucy Braun

The Illinoian till plain of southwestern Ohio[2] is a more or less delimited floristic district distinguished from adjacent areas by the presence of a group of characteristic species, by the occurrence of a number of species not in adjacent areas, by the greater abundance or even dominance of certain species rare or absent in either of the adjacent areas, and by the pronounced northern affinity of its flora. It is further marked by the paucity of its flora and by the absence of most of the showy spring flowers abundant in hillier sections of southern and southwestern Ohio, as *Erythronium*, *Trillium*, *Camassia*, *Anemonella*, *Isopyrum*, *Hepatica*, *Delphinium*, *Aquilegia*, *Jeffersonia*, *Sanguinaria*, *Stylophorum*, *Dicentra*, *Erigenia*, *Hydrophyllum*, *Mertensia*, *Senecio* and others.

Eastward, the till plain is separated by but a short distance from the eastern margin of the Interior Low Plateau with its prairie relic communities with rich mid-western flora, and from the Allegheny Plateau with its distinctly Alleghenian flora. (Braun, 1928a.) Westward, it overlaps the Cincinnati region, a dissected limestone and

[1] The reproduction of the maps in this paper is made possible through aid to Rhodora from the National Academy of Sciences.

[2] This area covers approximately 1500 square miles to the east of the Little Miami River (Figs. 4 and 5). Topographically, it is a flat or nearly flat upland, in places as yet little dissected by stream valleys, and covered by a mantle of glacial drift of Illinoian age. Due to the youthful topography of parts of the area, certain habitats have remained relatively unchanged since the Pleistocene. Acid soils prevail in the area; the Clermont silt loam or "white clay" is the most characteristic, and has developed on all the flattest portions of the area. Because of poor drainage, hydromesophytes find favorable habitats. The plant ecology of this region is treated in "Forests of the Illinoian till plain of Southwestern Ohio," Ecological Monographs, in press.

drift area (Braun, 1916). Northward, it is bounded by the rolling Wisconsin glacial plains which comprise a large section of western Ohio. In number of species it is much poorer than the regions to east or west, though it contains some found neither to east or west.

Plants of Illinoian Till Plain not found in adjacent areas, or abundant or characteristic in the till plain and rare or absent in either of the adjacent areas. Presence percentage indicated by the 1 to 5 scale; absence by X.

	Cincinnati Region	Illinoian Till Plain	Mineral Springs Reg.		Cincinnati Region	Illinoian Till Plain	Mineral Springs Reg.
Aspidium noveboracense	*	2	3	Viola lanceolata	X	1	X
Lophotocarpus calycinus	X	1−	X	Viola pallens	X	1−	X
Juncus bufonius	X	1	1	Viola sagittata	X	1	3
Luzula campestris var. bulbosa	X	1	X	Rhexia virginica	X	1	1−
Uvularia perfoliata	X	1	2	Cornus racemosa	X	3	X
Smilax Bona-nox	X	2	4	Chimaphila maculata	†	2	1
Habenaria peramoena	1−	3	X	Vaccinium stamineum	X	1	4
Tipularia discolor	X	1−	1	Vaccinium vacillans	X	1	4
Salix discolor	1−	3	X	Gentiana Saponaria	X	1–2	X
Polygonum arifolium	1−	2	X	Phlox maculata var. odorata	X	2–3	X
Polygonum sagittatum	1	3	1	Myosotis virginica var. macrosperma	X	1	X
Stellaria longifolia	*	2	X	Verbena hastata	1	1	X
Ranunculus laxicaulis	X	1	X	Trichostema dichotomum	*	1	X
Ranunculus pusillus	X	1−	X	Pentstemon calycosus	1	1	X
Ranunculus hispidus var. falsus	X	4	X	Pentstemon digitalis	1	1	X
Anemone quinquefolia	X	1	1	Gerardia flava (Aureolaria flava)	X	1	1
Cardamine bulbosa	1	3	X	Galium tinctorium	*	2	X
Spiraea tomentosa	X	3+	X	Mitchella repens	1−	4−	2
Spiraea alba	X	1–2	X	Viburnum pubescens var. indianense	X	4+	X
Spiraea latifolia	X	1−	X	Viburnum Lentago	X	1−	X
Pyrus melanocarpa	X	2–3	X	Lobelia puberula	X	1	1
Rubus hispidus	X	1	X	Lobelia cardinalis	*	3	1
Rosa carolina (Rosa palustris)	1	4	X	Vernonia noveboracensis	X	1−	X
Baptisia leucantha	‡	1−	X	Solidago rugosa	X	3+	X
Linum striatum	1	1	X	Aster umbellatus	X	3	X
Callitriche heterophylla	X	1	1	Solidago serotina	1	1	X
Ilex verticillata	*	4+	X	Pluchea petiolata	X	1−	X
Vitis labrusca	*	4	X	Hieracium marianum	X	1	X
Viola cucullata	*	3	1				

* Only in flat upland areas of the Cincinnati region, and hence in habitats which are western outliers of the till plain.

† Present in one station only.

‡ Reported nearly 100 years ago from one station which was ecologically similar to the till plain; now extinct (Braun, 1934).

Of approximately 200 species (exclusive of trees, grasses and sedges) of the till plain communities, 35 do not occur in the dissected Cincinnati region or even in dissected areas in the counties in which the till plain is most extensive and 39 do not occur in the Mineral Springs region of Adams County which is but a short distance to the east. Of these, 23 occur in neither region. The occurrence of 51 species absent in adjacent regions to east or west or both, emphasizes the floristic distinctness of the till plain. These species and six additional which are very rare to east or west are listed in the accompanying table, together with presence percentage (Pr %) of each.[1] Grasses and sedges are not included because of incomplete records.

The geographical distribution of the eight species of trees of highest percentage occurrence (Pr %) in the till plain is shown in the map, FIG. 1. Of these trees, only *Liquidambar styraciflua*[2] is floristically distinctive; the rest are general in Ohio. It is not found west of the till plain in southwestern Ohio, though it is abundant in the "Flats" of southeastern Indiana. Eastward, in the Allegheny region, it is a tree of alluvial flats. In the till plain, it is general only in the southern half (FIG. 2A) and scattered in the northern part. North of the till plain it is known in only a few stations. Similarly in Indiana, *Liquidambar* extends just north of the Illinoian drift area (Lindsey, 1932). Its known distribution in Ohio, Indiana and Kentucky is such as to suggest a relation to preglacial drainage patterns (FIG. 2B); due to post-glacial migration it has extended its range slightly into adjacent favorable territory. *Fraxinus profunda,* a distinctly southern species of the Mississippi embayment, is present in two stations in the till plain and not elsewhere in Ohio. Cow oak (*Q. Michauxii* Nutt. or *Q. Prinus* L), one of the characteristic trees of the Indiana "Flats" (Lindsey, 1932) does not enter our area.

Certain of the shrubs are very characteristic of this area. A larger number of shrubs is present than in the adjacent dissected areas. All except those of late successional stages are species requiring abundant soil moisture or acid soil or both. The widespread species are best represented by *Cephalanthus occidentalis,* which is transcontinental in range and reaches from the Gulf of Mexico to Canada. This species

[1] "By presence is meant the more or less persistent occurrence of a species in all the stands of a certain community." (Braun-Blanquet, 1932). As defined by Cain (1932). "Presence concerns the degree of regularity with which species reoccur in different examples of an association." This may be expressed in percentage, or less exactly, in the 1 to 5 scale suggested by both Braun-Blanquet and Cain.

[2] Nomenclature according to Gray's New Manual of Botany, 7th edit., 1908, except as noted.

is generally distributed in the wettest places in the till plain. Alleghenian species of acid soils are represented by *Vaccinium stamineum* (Fig. 4A) and *V. vacillans*, both of which are rare and local in the till plain. *Smilax glauca* (Fig. 4B), of southern range, is common, though

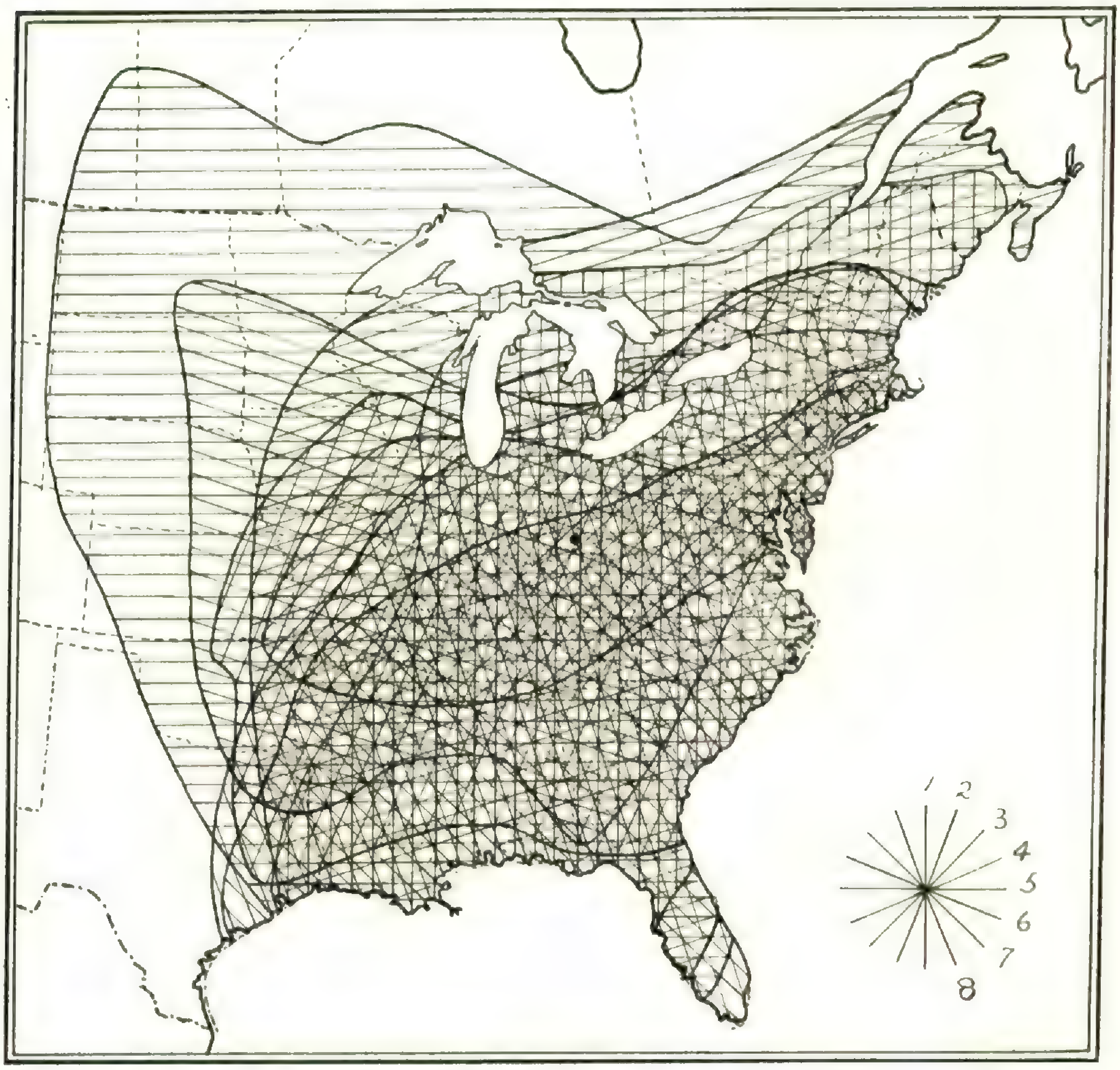

Fig. 1. Geographic distribution of eight trees of highest percentage occurrence in the till plain. Spokes of wheel in lower right-hand corner give direction of lines used for species indicated by numbers at ends of spokes:

1. Fagus grandifolia
2. Quercus alba
3. Quercus palustris
4. Acer rubrum
5. Ulmus americana
6. Carya ovata
7. Liquidambar styraciflua
8. Nyssa sylvatica

southern species are on the whole few and unimportant in the area. Northern and northeastern species, as *Vitis labrusca*, *Spiraea tomentosa* (Fig. 4C), *Spiraea alba*, *Ilex verticillata*, *Pyrus melanocarpa*, *Rubus hispidus*, *Salix discolor* and *Viburnum Lentago*, prevail. The map, Fig. 3, of the superimposed ranges of these eight species emphasizes

the general northeasterly range of the shrub flora of initial and intermediate successional stages. *Viburnum pubescens* var. *indianense* Rehder, is an endemic of the Illinoian till plain of Indiana and Ohio;

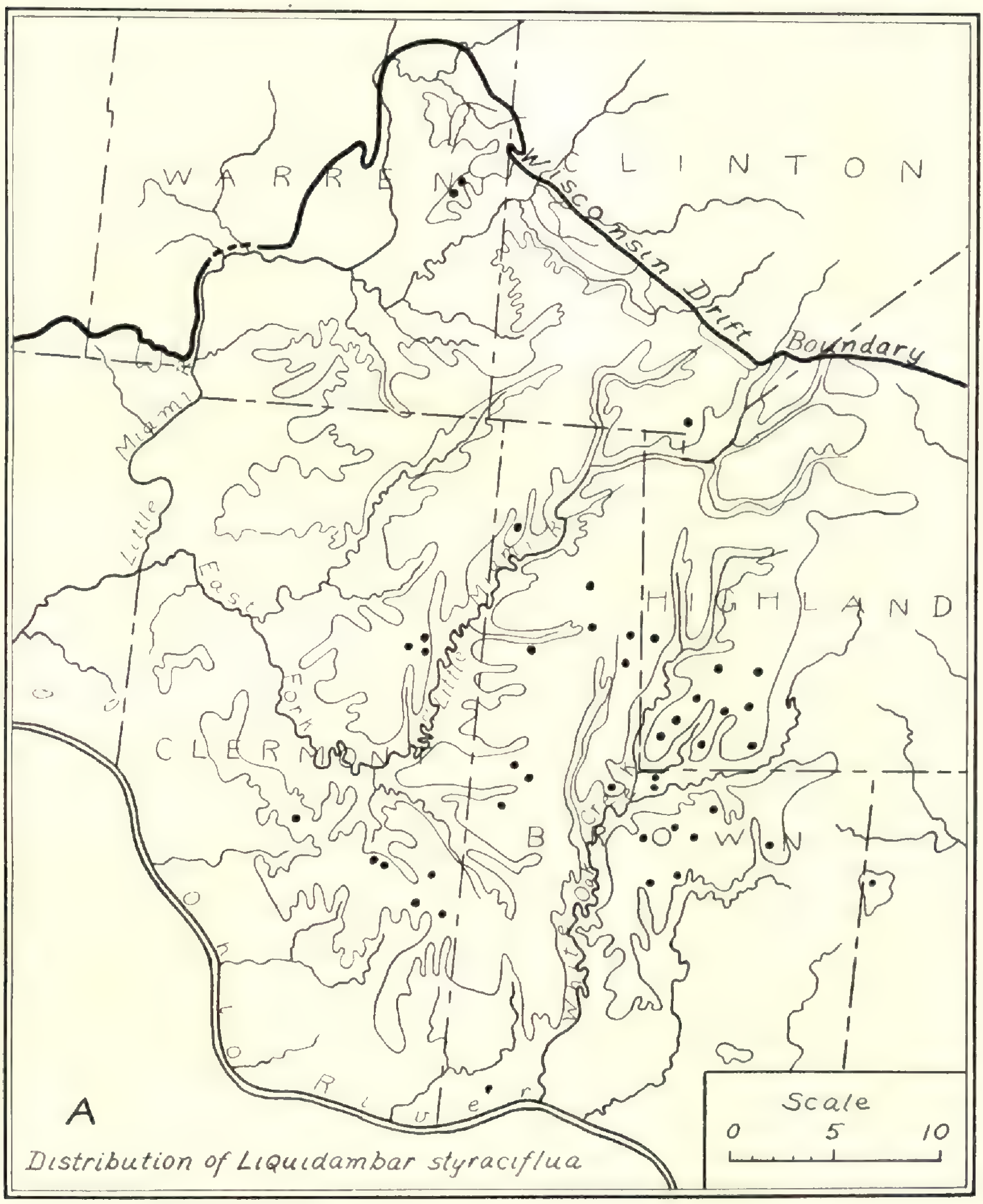

FIG. 2A. Distribution of LIQUIDAMBAR STYRACIFLUA in the Illinoian till plain (See FIG. 5).

the species from which it is isolated is of northern distribution. This is in contrast to that of the trees, which is to be expected, as the trees entered later with the advance of forest after Illinoian glaciation. *Rosa setigera* and *Hypericum prolificum* are more central in range.

As the later successional stages are reached and the vegetation approaches the climatic climax, shrubs of more southerly or wider range enter, as *Benzoin aestivale, Asimina triloba* and *Sambucus canadensis.*

Among the herbaceous plants, great variety is exhibited in types of geographic ranges. Species whose general range is comparable to that of deciduous forest prevail; this distribution is illustrated by *Medeola virginica, Polygonum sagittatum, Chelone glabra, Lobelia*

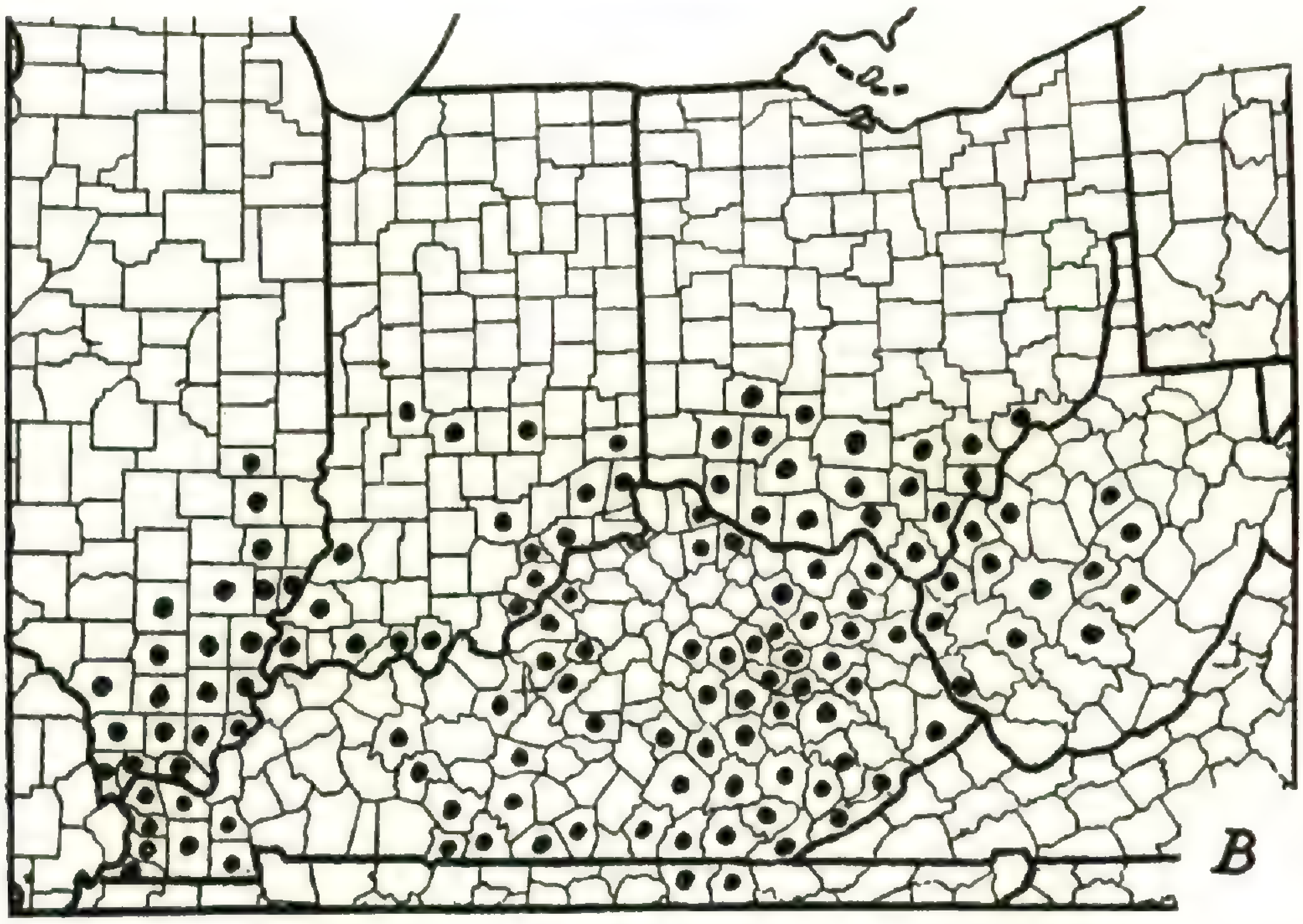

FIG. 2B. Distribution of LIQUIDAMBAR STYRACIFLUA in the Ohio Valley region (Data by courtesy of E. N. TRANSEAU).

cardinalis and *Solidago rugosa* of pin oak openings and secondary meadows and by *Pedicularis canadensis* and *Mitchella repens* of initial and intermediate forest stages of succession. All of these occur on the Illinoian till plain of Ohio and Indiana and are more or less generally distributed in these states.

Certain species, as *Aspidium noveboracense, Polygonum arifolium,* and *Chimaphila maculata* (FIG. 4D) are somewhat more eastern in range. Such species are general in eastern (Alleghenian) Ohio and more local westward in Ohio and Indiana.

Hierochloë odorata (FIG. 4E), *Anemone quinquefolia, Viola cucullata, Viola lanceolata* and *Viola pallens* are the most northern in range of

the plants of the till plain. The distribution displayed by these species in Ohio and Indiana is of particular interest. All occur in the northern, particularly lake counties, of these states, and in certain southern counties, particularly those affected by Illinoian glaciation. *Hiero-*

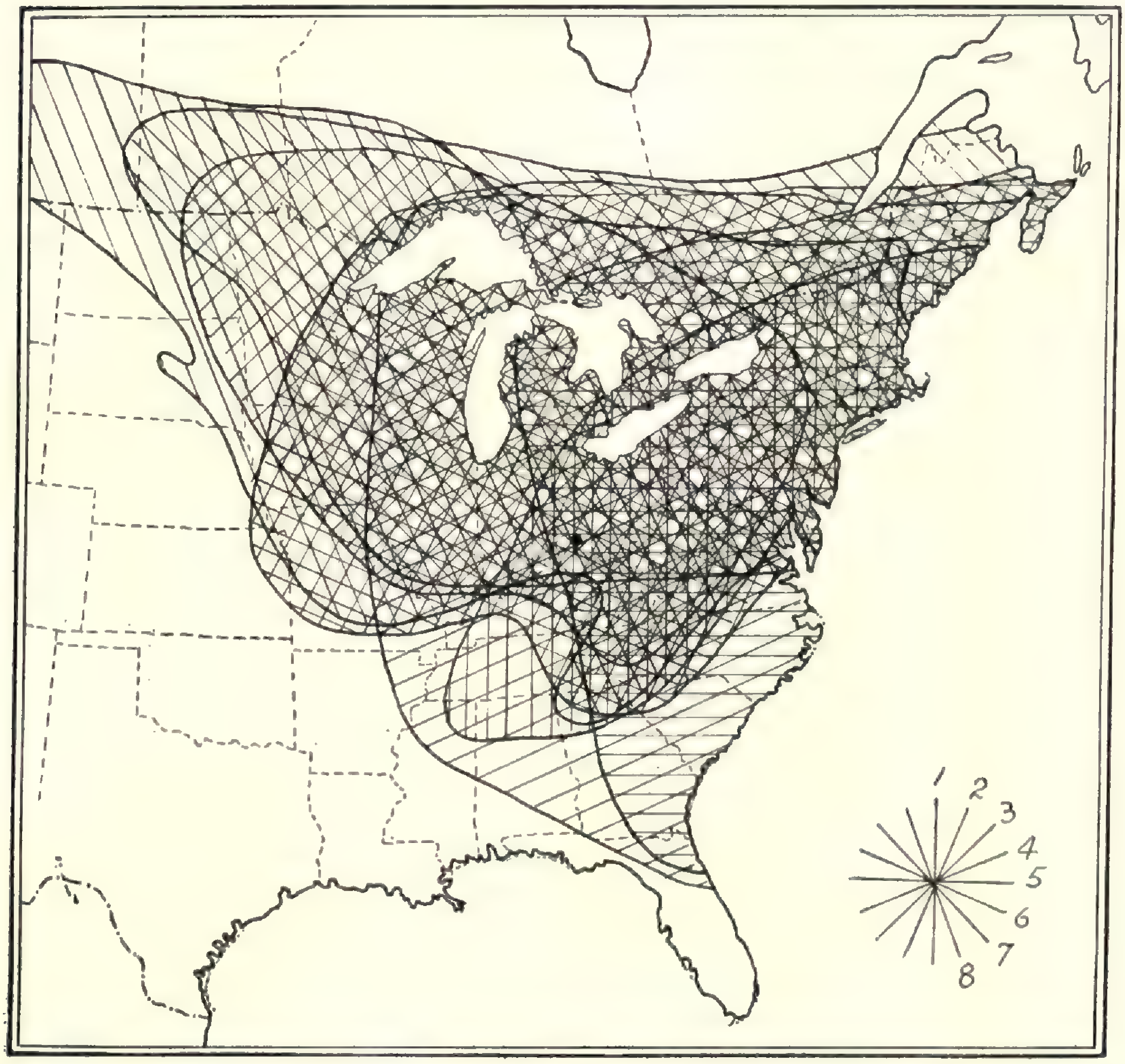

FIG. 3. Geographic distribution of eight characteristic shrubs of the till plain; pronounced northerly range evident:

1. VITIS LABRUSCA
2. SPIRAEA TOMENTOSA
3. SPIRAEA ALBA
4. ILEX VERTICILLATA
5. PYRUS MELANOCARPA
6. RUBUS HISPIDUS.
7. SALIX DISCOLOR
8. VIBURNUM LENTAGO

chloë in Indiana is confined to the north. The gap between northern and southern stations is pronounced in all except *Anemone quinquefolia*, a more mesophytic species than the others. This distribution appears to be related to glacial and post-glacial migrations; in the southern stations the species are relics (Braun, 1928b). Their absence from intermediate stations may be due to the Wisconsin xerothermic period.

Lilium canadense, Houstonia caerulea and *Aster umbellatus* are intermediate in range between the northern species and species of deciduous forest range. They display more general distribution in Ohio and Indiana than the more northern species. However, in Indiana there is some evidence of disruption in range between the "Flats" and other more northern stations for these species. This is to be expected if the peculiarity of ranges of these and the group of more northern species is a result of glacial migrations and climatic restrictions. *Phlox maculata* var. *odorata* (Sweet) Wherry and *Ranunculus hispidus* var. *falsus* Fernald are northern varieties of more widely distributed species. Both are common on the till plain. The distribution of the former is mapped by Wherry (1932).

Only one herbaceous plant of the till plain (an amphibious plant) is extremely southern in distribution, namely *Ranunculus pusillus*, a plant of the Atlantic and Gulf Coastal Plain and Mississippi embayment. It is known from only one county in Ohio and one county in Indiana, both stations in the Illinoian till plain. *Lobelia puberula, Rhexia virginica* (Fig. 4G), *Tipularia discolor* (Fig. 4H), *Pluchea petiolata* and *Lophotocarpus calycinus* (Fig. 4I) are southern plants, all more or less rare and local on the Illinoian till plain of Ohio. *Lobelia* is somewhat scattered in both Ohio and Indiana; *Rhexia* and *Tipularia* occur in the south and in the Lake counties in Ohio, *Tipularia* only in the south in Indiana. *Rhexia* displays a type of distribution common to many migrating southern plants—stations in unglaciated and adjacent glaciated territory, and along the Great Lakes whither they may have entered by Mississippi valley routes or eastern routes during or following the last or marine substage of the Pleistocene. These southern plants are, in contrast to the northern ones, regarded as relatively recent entrants in the till plain. *Lophotocarpus* is an example of a southern plant which is much more general in southern Indiana than in Ohio.

Habenaria peramoena (Fig. 4J), *Coreopsis tripteris* and *Baptisia leucantha* (Fig. 4K) are central in range, the first with most restricted range but very general in the till plain, the last more western in range and very local in the till plain. The distribution of *Baptisia* in Ohio (the western half of the state) and its distribution in Indiana (represented in all quarters) is in keeping with its usual community affiliations (prairie) and post-Wisconsin eastward migration. *Habenaria*, south-central in range, is in both states confined to southern stations, unglaciated and glaciated.

Wides, as is to be expected, are best represented among the aquatic and amphibous species, though the most widespread and cosmopolitan of such species as *Typha latifolia, Spirodela polyrhiza, Lemna minor, Ceratophyllum demersum*, etc., are absent or rare in the till plain.

Representative examples of the distribution displayed in Ohio and Indiana[1] by plants of the several distribution types are shown in Fig. 4, A to K. To show relation of ranges to age areas of the states, a glacial map, Fig. 4L, is included.

To summarize, the flora of the Illinoian till plain, though composed largely of intraneous species, nevertheless contains a considerable percentage of forms which, if not actually extraneous, have somewhat discontinuous ranges as demonstrated by their absence from adjacent areas. Its species are derived from different floristic regions: species of the deciduous forest region prevail; western species are poorly represented; a few Alleghenian species from the nearby Allegheny Plateau are present; the southern element is represented by tree, shrub and herb species; the strong northern affinity of the flora is demonstrated by a considerable group of species of north-northeastern range. This northern affinity is also indicated by the "life form spectrum" of the younger successional communities (Withrow, 1932).

The explanation of the ranges of species which occur on the till plain is to be found in post-Illinoian and recent migrations; post-Wisconsin movements seem inadequate to explain the distribution of the group of northern species. The absence of western species, other than the mid-western *Baptisia leucantha* (Fig. 4K), is in contrast to areas to east and west where relic prairie species do occur. The prairie relics to the west in the Cincinnati region are certainly of Wisconsin age; those to the east in Adams County have been interpreted in a previous paper (Braun, 1928b) as of pre-Illinoian age. The absence of true loess in the region to the east of the Little Miami River—in the area of the Illinoian till plain—is evidence that the Wisconsin xerothermic period was not extreme in this area and hence that occupying vegetation was not displaced by more xeric types. The lack of disturbance to vegetation in southern Ohio by the Wis-

[1] Ohio distributions are taken from Schaffner, Revised Catalog of Ohio Vascular Plants, 1932; and from Transeau and Williams, 1929. The distribution of Indiana shrubs from Deam, 1932; of grasses, Deam, 1929. For other distributions, the writer is indebted to Miss Dorothy Parker who has secured the data from distribution records filed at Butler University.

consin xerothermic period is further attested by the boreal relics along the nearby glacial border to the east, and by the many Tertiary relics, as *Styrax*, *Calycanthus*, *Halesia*, in unglaciated territory not far from the glacial boundary, and by the marked contrast between the vege-

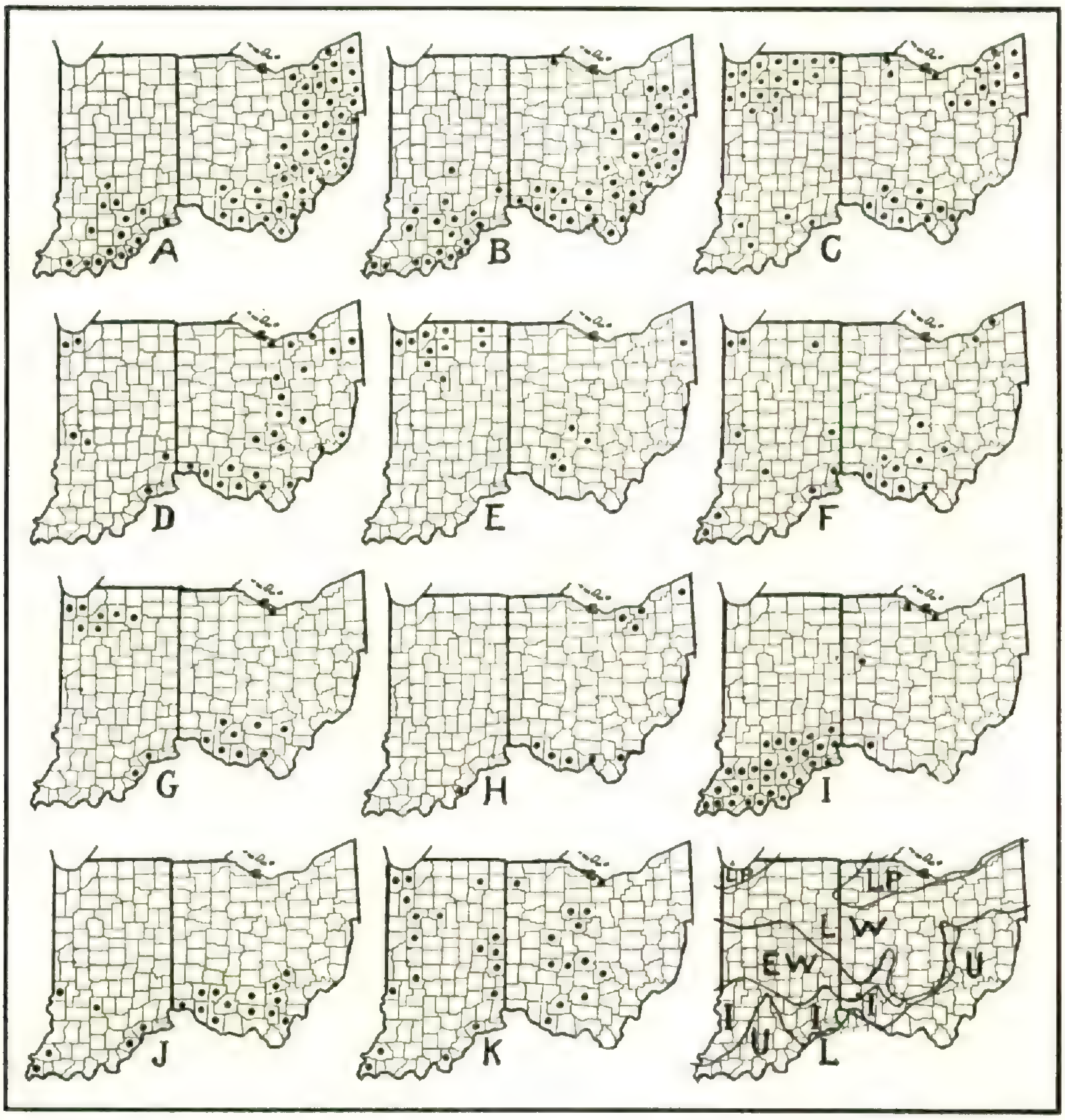

Fig. 4. Examples of types of distribution in Ohio and Indiana displayed by plants of the Illinoian till plain:

A. Vaccinium stamineum
B. Smilax glauca
C. Spiraea tomentosa
D. Chimaphila maculata
E. Hierochloë odorata
F. Viola cucullata
G. Rhexia virginica
H. Tipularia discolor
I. Lophotocarpus calycinus
J. Habenaria peramoena
K. Baptisia leucantha

L. Glacial map of Ohio and Indiana (after Leverett):

U. Unglaciated area.
I. Illinoian drift.
EW. Early Wisconsin.
LW. Late Wisconsin.
LP. Lake plains of glacial Lakes Maumee and Chicago.

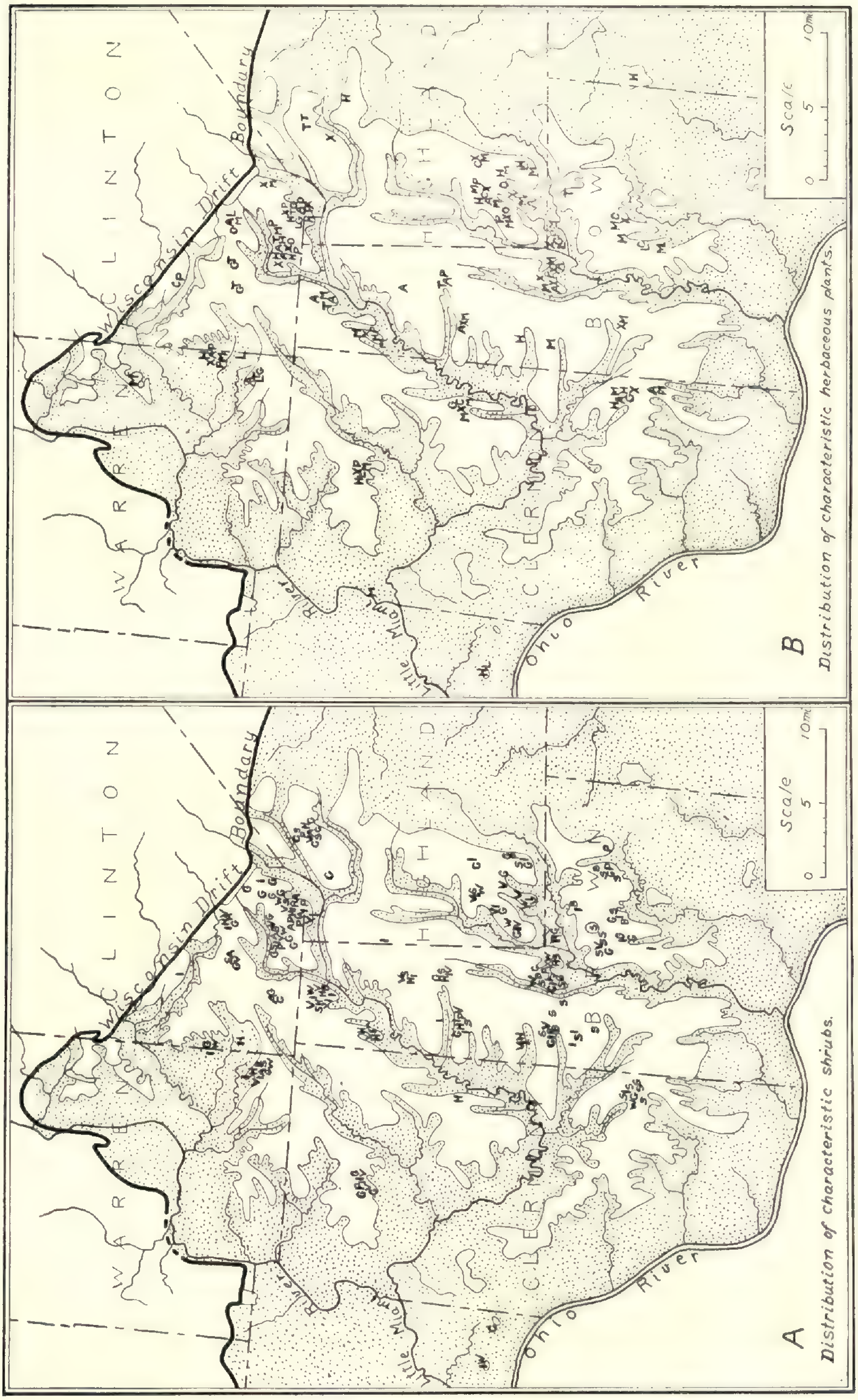

Fig. 5. Distribution on the till plain of characteristic shrub and herb species, showing mass occurrence in eastern and northeastern parts, greater rarity in western parts, and almost complete absence in northwestern part. White unshaded portions of map, south of Wisconsin drift boundary, are areas of Clermont silt loam—the flattest portions of the till plain.

tation, generally, of glaciated and unglaciated areas of Ohio. Boreal hydro-mesophytic species were able to persist on the Illinoian till plain throughout the period of Wisconsin glaciation and are represented today by the many plants of northern distribution. If they did later move across the Wisconsin drift area they were eliminated by the increasing aridity. Hence their ranges are remarkably disrupted. The occurrence of a young endemic of northern relationship—*Viburnum pubescens* var. *indianense*—is further evidence of the long isolation of the northern relics on the till plain. The same climatic condition which appears to be responsible for the disrupted ranges of the northern species made possible marked eastward movement of prairie. But, to the migrating prairie species the Illinoian till plain was unfavorable and few species were able to invade it. The long period of conifer dominance on the youngest glaciated land (the Wisconsin drift area) which is so amply demonstrated by pollen studies of Sears (1930, 1931) seems never to have affected this area, or any of the great southern lobe of the Illinoian glacier. That migratory movements of species are still in progress is indicated by the presence and behavior of southern species in the area (Fig. 2A). This element is relatively new. Though numerically few and for the most part found in but few stations, these species are important in pointing to the ultimate displacement of the northern relics.

The more general distribution and greater abundance of the characteristic species in the northeastern and eastern part of the till plain (Brown, Highland, Clinton counties), their greater rarity in the western part (Clermont County) and almost complete absence in the northwestern part (Warren County) raises some question as to the factors which may have affected the distribution of species within the area of the till plain (Fig. 5A, B). Certainly the effects of the Wisconsin xerothermic period would have been more pronounced in the western and northwestern parts of the area than elsewhere. Present unequal distribution of summer rainfall in the area, resulting in "dry islands," at least one of which is in an area of lesser abundance of characteristic species—the middle western part—coupled with the lowering of the water table by man's interference may have been detrimental to these species, all of which are hydro-mesophytes. The topography of the northwestern part of the area (Warren County) differs slightly from the rest of the plain; its ridges and depressions are longitudinal, lying in a northeast-southwest direction, instead of irregular, and the plain here tips southwestward. This part, too, is

partly surrounded by the Earlier Wisconsin drift. Position and topography suggest the possibility of some Wisconsin wash across this part of the plain. Thus all post-Illinoian vegetation would have been destroyed in that area, which then would have been occupied by invasion from the south. Here are two of the southern tree species—*Liquidambar styraciflua* and *Fraxinus profunda*. *Rosa setigera*, of midwestern range, is more abundant here and in the middle western part of the Illinoian till plain than elsewhere.

The floristic distinctness of the Illinoian till plain is due to the prevalence of the hydric or hydro-mesic environment favoring a group of species which find few possible habitats either to east or west; to the prevailingly acid soil, which may account for the absence or rarity of many of the species common in adjacent areas and for the presence of certain Alleghenian acid soil species; and to the glacial and post-glacial history of the area which favors the persistence of many northern species.

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NOTES ON THE FLORA OF GLACIER NATIONAL PARK, MONTANA

Willard T. McLaughlin

Since the publication of Standley's Flora of Glacier National Park[1] there have been seventy supplementary species and varieties added by various collectors,[2] bringing the total up to well over a thousand. The area is a fascinating one for botanical study, embracing, as it does, 1533 square miles of mountain territory of extreme ruggedness, and offering a variety of plant habitats ranging through four life zones, from plains to arctic-alpine summits and from sphagnum bogs to arid mountain sides. Many additional species would be included if the park boundaries were extended a few miles eastward into the plains. While the region has been visited by many botanists of note, the western side, north of Lake McDonald, botanically speaking is almost virgin territory.

The following notes are based on observations and collections extending over the five summers from 1930–1934.

* Phegopteris polypodioides Fée. Growing in crevices in dripping cliffs along the trail to Sperry Glacier above Sperry Chalets. August 1, 1931. No. 2080.

Standley states, in reference to *Phegopteris Dryopteris* (L.) Fée, "this species has been incorrectly reported from the park as *Phegopteris polypodioides* Fée." The writer is unable to determine who reported the latter species, but there is certainly no mistaking the identity of the two. Within the region *P. Dryopteris* is a common fern in moist coniferous woods at middle elevations where it is to be found growing with *Tiarella unifoliata* Hook. and *Clintonia uniflora* (Schult.) Kunth, while *P. polypodioides* seems to prefer the dolomitic cliffs at higher elevations in company with *Adiantum pedatum* L. var. *aleuticum* Rupr.

*Cystopteris montana (Lam.) Bernh. Moist ledges, Gunsight Pass. Collected by Mr. H. G. Rugg; July, 1932.

[1] Standley, Paul C. Flora of Glacier National Park, Montana. Contrib. U. S. Nat. Herb. **22,** part 5: 235–438. 1921.

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Nelson, Aven. Rocky Mountain Herbarium Studies II. American Jour. Bot. **21**: 573–582. 1934. *Arnica Maguirei* and *A. trina* new species from Glacier Park.

* Not reported from the park by Standley or subsequent authors.

This interesting alpine and arctic fern is listed by Eaton as "certainly one of the very rarest of North American ferns." It has apparently been previously reported in the United States only from Colorado.

LARIX LYALLII Parl.

This endemic of the high mountain regions of the northwest is decidedly uncommon within the park. Concerning it Standley writes, "said to grow in a few places about timberline, but not seen by the writer." Maguire reports, "a fine grove at timberline, Preston Park." The present writer will never forget the arduous climb to the summit of the unfrequented Boulder Pass in the extreme northwestern corner of the park. After climbing above all but the most stalwart and matted arboreal alpines (*Abies lasiocarpa, Picea Engelmanni,* and *Pinus albicaulis*) the trail pauses for a brief spell on the margin of a great ice-scoured basin of dark red argillite, and there, sheltered from the chilling blasts, grows a beautiful grove of the mountain larch, sturdy and short and remarkably slow growing, distinguished at once from the lowland *Larix occidentalis* Nutt. by its stockier build and the very pubescent new growth.

SALIX COMMUTATA Bebb var. DENUDATA Bebb. Meadows, Iceberg Lake. July 21, 1930; No. 923. Reported previously only by Maguire from Gunsight Lake.

LEWISIA PYGMAEA (Gray) Robins. (*Oreobroma pygmaea* (A. Gray) Howell, of Standley). Collected by Umbach (Standley) at east entrance on creek bank. Collected by the writer in rocky alpine meadows near Sperry Glacier. July 10, 1931; no. 2125.

RANUNCULUS AQUATILIS L. var. CAPILLACEUS D. C. Probably the plant reported by Standley under *Batrachium Drouetii* (Schultz) Nyman.

PAPAVER PYGMAEUM Rydb.

This diminutive little poppy of the high ridges and moraines is seldom to be found in any abundance. The writer found a single plant on the moraine of Blackfoot Glacier and perhaps fifteen or twenty individuals within a few square yards on the moraine of Sexton Glacier. Rydberg's original description[1] states that the petals are yellow, but all the specimens seen agree rather with Standley's description, "petals orange with a yellow spot at the base."

*SMELOWSKIA LOBATA Rydb. Rocky alpine meadow east of summit of Logan Pass. July 20, 1932; no. 2540. Rocky alpine meadow near summit, Siyeh Pass. July 15, 1934; no. 3296.

[1] Rydberg, P. A. Studies in the Rocky Mountain Flora VII. Bull. Torrey Bot. Club **29**: 145–160. 1902.

In the latter location the plant was growing with or at a slightly higher elevation than *S. americana* Rydb., and is later flowering than this species.

Physaria didymocarpa (Hook.) A. Gray. Collected on a dry talus slope at 6500 feet elevation in Baring Basin where it grew with *Eriogonum depressum* (Blankinship) Rydb.

The *Physaria* is characteristically a plains species, but, like many another, is quite at home on dry open mountainsides at high elevations.

Parnassia palustris L. Previously reported from a wet thicket at St. Marys. Collected at Mud Lake and in boggy ground at the lower end of Lower Kintla Lake.

Probably fairly common in low ground on the west slope.

*Tellima grandiflora (Pursh) Dougl. Under bushes along Granite Park fire trail an eighth of a mile from the Going-to-the-Sun Highway. June 25, 1934; no. 3224.

A diligent search failed to reveal more than a single plant. This is apparently the easternmost station for this Pacific slope species.

*Philadelphus Lewisii Pursh. Growing in abundance on a dry, rocky hillside along the highway, one mile east of Going-to-the-Sun Chalets. July 16, 1934; no. 3275.

Hypericum Scouleri Hook. Under bushes near Going-to-the-Sun Chalets. July 24, 1933; no 2955.

The plants were taller and more lax than the usual form characteristic of the alpine meadows and open slopes.

Epilobium angustifolium L. var. platyphyllum (Daniels) Fernald.[1]

The fireweed within the park certainly attains the perfection of its development at lower levels along the plains margin and in burned over areas, but it is also found in great abundance in meadows within the Hudsonian zone. By August first it is, in many of these higher meadows, the dominant plant. Prof. Fernald, in his discussion of possible hybridization between *Epilobium latifolium* L. and *E. angustifolium*[2] states, "that imperfection of pollen in this species cannot be asserted to be due to hybridization with *E. latifolium* should be apparent from the vast distances (often 100 to 1000 miles and sometimes overseas) between the supposed hybrid offspring and the nearest colonies of one of the assumed parents." However, in Glacier Park the two species in the vicinity of Logan Pass and elsewhere do grow within a few feet of one another. Moreover, as Standley has

[1] Fernald, M. L. American Variations of Epilobium, Section Chamaenerion. Rhodora **20**: 1–10. 1918.

[2] Fernald, l. c. 10.

pointed out, *E. latifolium* is found occasionally at low altitudes growing along stream margins.[1]

*Cornus stolonifera Michx. var. Baileyi (Coult. & Evans) A. A. Drescher[2] (*C. Baileyi* Coult. & Evans of authors).

Although Standley reports only *C. stolonifera* it has already been pointed out[3] that the common form west of the divide is not *C. stolonifera* but is apparently referable to *C. stolonifera* var. *Baileyi*. On the other hand all the east side collections made by the writer are typical *C. stolonifera*.

*Phyllodoce hybrida Rydb. Probably a hybrid between *P. empetriformis* (Smith) Don and *P. glandulifera* (Hook.) Coville. Especially abundant at the summit of Logan Pass, growing with the two parent species.

Ledum glandulosum Nutt. In spongy ground near the summit of Boulder Pass. Sept. 8, 1931; no. 3321.

Reported by Standley as a lowland species; here growing at about 7500 feet.

*Dodecatheon acuminatum Rydb. Wet mossy bank, Virginia Falls, Upper St. Mary's Valley. August 13, 1934; no. 3317.

Pinguicula vulgaris L. Wet spongy bank near Hidden Lake at 7000 feet elevation. July 30, 1932; no. 2589.

*Orobanche Sedi (Suksd.) Fernald.[4] Grinnell Glacier Trail, 5500 feet elevation. July 13, 1930; no. 787. In moist rock crevices, parasitic on *Thalictrum megacarpum* Torr. Mt. Brown; July 4, 1931.

Erigeron lanatus Hook. Fairly abundant near the summit of Siyeh Pass.

In all plants seen by the writer the rays were white.

Northwestern University,
Evanston, Illinois.

Eleocharis caribaea, var. dispar in Ontario.—While working over a collection of plants presented to the Herbarium of the University of Toronto by Dr. R. F. Cain, the writer was pleased to find a

[1] In the discussion cited, Fernald merely pointed out that certain individuals which had been designated, in the paper criticized, as hybrids of *Epilobium angustifolium* and *E. latifolium*, merely because of their imperfect pollen, were growing 100 to 1000 miles away from the nearest colonies of the latter species. In much of the limited range of *E. latifolium*, *E. angustifolium* is present; from much of the extensive area of *E. angustifolium*, *E. latifolium* is absent.—Eds.

[2] Drescher, A. A. Preliminary Reports on the Flora of Wisconsin XXII. Cornaceae. Trans. Wisconsin Acad. Sciences, Arts, and Letters **28**: 187–190. 1933.

[3] Blankinship, J. W. Supplement to the Flora of Montana. Montana Agric. Coll. Sci. Studies **1**: 32–109. 1905.

[4] Not *O. uniflora* L. See Fernald, M. L. Two Summers of Botanizing in Newfoundland. Rhodora **28**: 236. 1926.

specimen that agreed very closely with the published descriptions of *Eleocharis caribaea* (Rottb.) Blake, var. *dispar* (E. J. Hill) Blake. This identification has since been confirmed by Dr. M. L. Fernald. The specimen may be cited:

In wet sand on Lake Erie shore, Rondeau Provincial Park, Kent Co., Ontario, *R. F. Cain*, Aug. 14, 1934.

This is apparently the first record of this very local variety, other than from Whiting, Indiana, where it has been known for many years. The Ontario record marks such a surprising jump eastward in its range that one is led to expect that careful collecting in the region of the lower Great Lakes will reveal its presence elsewhere between these two stations.

A duplicate specimen has been deposited at the Gray Herbarium.—T. M. C. Taylor, Department of Botany, University of Toronto.

Eleocharis caribaea, var. dispar in Michigan.—The inland variety, *Eleocharis caribaea* (Rottb.) Blake, var. *dispar* (E. J. Hill) Blake, of the tropical and subtropical chiefly coastal plain species, *E. caribaea*, has heretofore been known only from the type locality at Whiting, Lake County, Indiana, where apparently it has not been collected during the past forty years.[1] Consequently it was with no little surprise that the writer came upon an extensive colony of it at Silver Lake, Washtenaw County, Michigan during the past summer, —a station approximately 200 miles northeast of the type locality. Here, on the wet, sandy margin of a large pond, it was growing profusely associated with *E. acicularis* and *E. olivacea, Cyperus rivularis, Rynchospora capillacea, Juncus alpinus* var. *fuscescens, J. brachycephalus, Lobelia Kalmii, Agalinis paupercula* var. *borealis, Mariscus mariscoides, Lycopus americanus, Hypericum virginicum, Panicum flexile* amd *Spiranthes cernua.*

Recently it was learned that Mr. Deam had also discovered *E. caribaea* var. *dispar* at three additional stations for Indiana, all during the summer of 1934, so that its distribution is not as restricted as had been supposed and further collections of the Eleochares may be expected to reveal it from other localities adjacent to the southern shores of the lower Great Lakes.

The data for the recent collections of this plant are as follows:

Indiana: east side of Little Chapman Lake, 4 miles northeast of

[1] Svenson, H. K. Monographic Studies in the Genus Eleocharis. Rhodora 31: 227. 1929.

Warsaw, Kosciusko County, *C. C. Deam*, no. 55,328; north end of Clark St., Gary (formerly Pine), Lake County, *C. C. Deam*, no. 55,529; low marl border of east side of Adams Lake, 3 miles northeast of Wolcotville, Lagrange County, August 16, 1934, *C. C. Deam*, no. 55,357A. MICHIGAN: open, sandy shore of pond east of Silver Lake, 6½ miles northwest of Dexter, Washtenaw County, August 31, 1934, *F. J. Hermann*, no. 6430 (Gray Herbarium, Brooklyn Botanic Garden), and November 26, 1934, no. 6457.—F. J. HERMANN, University of Michigan.

ACORUS CALAMUS IN AMERICA

MURRAY F. BUELL

ACORUS CALAMUS L. in its several varieties grows without cultivation over a large part of the north temperate zone and the adjacent tropics. In eastern Asia, where Engler[1] recognizes four varieties, it occurs in one form or another from Ceylon to the Amur River, and inland as far as Lake Baikal. In Europe it occurs from the Alps northward to Scandinavia and Russia, and in a few places in the Mediterranean region. In North America it is widely distributed east of the Rocky Mountains from the Gulf of St. Lawrence to Florida, and westward to Texas, Montana, and as far north as the Peace River. In both Europe and North America the plant seems to belong uniformly to Linnaeus' var. *vulgaris*.

No one seems ever to have questioned that the species in some form is indigenous in Asia. The presence of several varieties not known elsewhere, and the occurrence of a second species (*A. gramineus*) with a substantially similar range, seem to indicate its native status beyond a shadow of doubt.

In Europe, although the plant is said to be uniformly sterile, botanists did not seriously question its indigenous status until the second half of the nineteenth century, but by the beginning of the present century European botanists seem to have been pretty well agreed that it is an introduced plant which has become naturalized since the middle of the sixteenth century, and the researches of Mücke fully confirm this.[2]

As to its status in North America various opinions are expressed by

[1] ENGLER, Das Pflanzenreich, IV, 23 B. 308. (1905).

[2] See ENGLER, l. c.; ASCHERSON AND GRAEBNER, Synopsis, II, 2. 365 (1904). Mücke, M., Über den Bau und die Entwicklung der Früchte und über die Herkünft von Acorus calamus L. Bot. Zeit. LXVI, 1–23. (1908). According to the latter author the immediate source of the plant was from living rhizomes sent from Constantinople to Matthiolus in Prague in 1557, and to Clusius in Vienna in 1574. What was the ultimate source of this material remains to be determined.

different authors: Asa Gray[1] says of it: "Probably truly indigenous northward." Dame and Collins[2] believe it to be native in Massachusetts. On the other hand, Chapman[3] states that in the southern United States it is "apparently introduced." As to its condition in the interior of the continent, Melvin Gilmore[4] believes that it was brought by the Indians from the Atlantic coast and that elsewhere it occurs only near the sites of old Indian camping grounds. In his discussion he makes the statement, "Calamus is a plant which very seldom blooms and I have never known it to produce seeds, so that it is not adapted to disseminate itself or invade new territory."

This is certainly not a correct statement of the situation in Minnesota, nor apparently in other parts of the interior of North America. I have found it producing good fruit at widely scattered locations in Minnesota: in the east central part of the state at Savage in Scott County and also along the Mississippi River at St. Paul; two hundred miles to the northwest at the headwaters of the Mississippi; even farther to the northeast near Ely, St. Louis County, where the plant was thriving in a backwater of Stony River, and again on the sandy shore of Burntside Lake. Furthermore, University of Minnesota herbarium specimens show well developed fruiting spikes from all parts of Minnesota, and the same is true of specimens from Illlinois and Indiana, and as far east as northern New York. Through correspondence with botanists in various parts of the country I have learned that this range of good fruiting material may be extended as far south as Kansas and Missouri.

The places where the plant fails to produce fruit here are those locations where it is shaded for a good part of the day or where the ground dries out during early or mid-summer. Calamus seems to thrive only where the rhizome is continuously submerged, at least until late summer, and where it receives the maximum sunlight. Soil type has considerable effect on its luxuriance. Where plants are growing in sand, vegetative growth is less; where they are rooted in rich humus or muck, the rhizomes and leaves are conspicuously larger, but in either case it fruits freely. The seeds produced are viable and germinate readily the following spring. How frequently they germinate in nature in Minnesota is not known, but in at least

[1] Gray, Manual. ed. 5. 478. (1868).

[2] Dame, L. L. and F. S. Collins, Flora of Middlesex. 98. (1888).

[3] Chapman, Flora. ed. 3. 466. (1897).

[4] Gilmore, Melvin R. Dispersal by Indians a factor in the extension of discontinuous distribution of certain species of native plants. Papers Mich. Acad. Sci. Arts and Letters. XIII, 89–94. (1931).

one case I have found abundant vigorous seedlings. This was in late June, 1933, on the shores of Burntside Lake near Ely, in one of the coldest parts of the state.

There seems no valid reason to doubt that *Acorus Calumus* is native to North America. There are in the Gray Herbarium a few fruiting specimens from New England,[1] and the facts seem to indicate very definitely that the plant is wholly native in the interior. Here in Minnesota the plant is common throughout the state and bears fruit freely. There is nothing about the local distribution to suggest an introduced plant. Its general distribution is very much like that of *Symplocarpus foetidus* and the genus *Arisaema* of the *Araceae*, as well as many other genera and even species of other families, i. e., it occurs in Asia and eastern North America.[2] This distribution is known in many cases to be a direct result of the Pleistocene disruption of an earlier and much wider circumboreal range. One does not question that *Symplocarpus* has lived in our swamps or *Arisaema* in our woods for ages past. It seems no more than reasonable to assume that these hardy aroids of similar distribution have had the same paleontological history, though the records in the case of *Acorus* have become much blurred by human interference.

University of Minnesota.

Hitchcock's Manual of the Grasses.—For several years botanists of the United States have been looking forward to the appearance of Hitchcock's illustrated volume on the grasses. Now, in May, the first copies have become generally available, although the title-page says

[1] It has been suggested that the sterile European race may have been introduced into certain parts of North America. Without doubt the early settlers along the Atlantic coast were familiar with the domestic uses of the plant. In fact even to-day the rhizomes are used somewhat by their descendants in making candy, and in rural New England one occasionally finds "candied sweet flag" for sale. These settlers possibly brought rhizomes of *Acorus* with them, and it seems possible that some of the material now growing wild in the older settled areas is actually from this source. In this connection see Graves, C. B., et al, Catalogue of the flowering plants and ferns of Connecticut. 111. (1910).

[2] Its actual status seems to be intermediate between the two genera cited. *Symplocarpus*, a monotypic genus, occurs in apparently identical form in eastern North America and temperate East Asia. *Arisaema* with two or three species in eastern North America extending into South America has several closely related though obviously distinct species in temperate eastern Asia, as well as a large number of species in the tropics of the Old World. *Acorus Calamus* occurs as var. *vulgaris* in the eastern half of North America, and at least in large part as distinct varieties in eastern and southeastern Asia, while there is a second Asiatic species. Engler, indeed, cites several east Asiatic localities for var. *vulgaris*. Not having seen any Asiatic specimens, I am unable to judge whether these are identical with our North American material. If they are, the natural distribution of this variety would be very like that of the skunk cabbage cited above.

"Issued February 1935." The book[1] is a plump work of more than a thousand pages and abundant illustrations. In typography and paper it is a typical product of the Government Printing Office. Each genus is illustrated, often by the excellent drawings already generally familiar in earlier works, such as *The Genera of Grasses of the United States* (1920), and many species are partially illustrated by inset figures, with maps intended to show their ranges; the genera are supplied with block-keys and a stereotyped description is given for each species. In sequence of tribes the admirable system of the late Professor C. E. Bessey (1911) is essentially followed, although the source of the system is obscured by the statement: "The sequence of tribes and genera . . . is that found in The Genera of Grasses of the United States" (Hitchcock, 1920), where Bessey was not mentioned and his phylogenetic sequence was announced as "a new sequence based on the complexity of the flower structure." The sequence is the most natural yet proposed and it is, therefore, desirable that its author be remembered.

In detail the work is, naturally, the record of its author's judgments regarding generic and specific lines; and, in estimating it from the viewpoint of a taxonomist who has studied the grasses, along with many other groups, in the northeastern States, it must be clearly emphasized that he cannot speak for critical students in other sections of the country. With the generic treatments, which in only a few places (as in the *Paniceae*) seriously depart from the well known concepts of Hackel, most botanists will agree. With the specific treatments there will be less agreement; the standards for species in the book are altogether too elastic. The very trivial and inconstant fluctuations of pubescence and the minutest differences in size of spikelets in *Panicum* are still maintained as characterizing sound species (*P. Werneri* and *linearifolium; P. xalapense* and *laxiflorum; P. Clutei* and *mattamuskeetense; P. barbulatum* and *dichotomum; P. implicatum, huachucae*, etc.; *P. tsugetorum* and *columbianum; P. Helleri, Scribnerianum* and *oligosanthes;* etc.). Similarly quite trivial differences in length and abundance of pubescence (largely a vegetative response) and in small fractions of millimeters in size of spikelets are treated as specific in other groups (*Paspalum*, etc.). These matters have been sufficiently studied[2] by competent field-botanists who intimately know their own grasses so that the maintenance of thoroughly discredited "species" as on a par with unquestioned and invariable ones cannot appeal to any but those who set the lowest standard for species.

Singularly enough, Hitchcock often "leans over backward" in his unwillingness to recognize as species or even as varieties or distinguishable forms plants which other discriminating field-botanists of long experience never hesitate to call true species. *Agrostis hyemalis* (Walt.) BSP. (*A. antecedens* Bicknell) is a good illustration. This and *A. scabra* Willd. are treated by Hitchcock as identical, under *A. hyemalis* (the specific name unjustifiably altered by him from Walter's original to *hiemalis*).

[1] A. S. Hitchcock, *Manual of the Grasses of the United States* (U. S. Dept. Agric. Misc. Pub. no. 220). 1040 pp., 1696 figs. Washington, ? February, 1935. For sale by Superintendent of Documents, Washington, D. C. Price $1.75.

[2] See, for instance, Deam, Grasses of Indiana (1929); Fernald, Rhoroda, xxiii. 223–228 (1921, 1922), xxxvi. 20–22 and 61–87 (1934); Fogg, Rhodora, xxxii. 233 (1930); House, Bull, N. Y. State Mus. no. 254 (1924); Stone, Pl. So. N. J. (1910); Weatherby, Rhodora, xxx. 134 (1928); Weatherby & Griscom, Rhodora, xxxvi. 35 (1934); Weatherby, Knowlton & Bean, Rhodora, xxxi. 107 (1927); Wiegand & Eames, Fl. Cayuga L. Basin (1926).

Nevertheless, the common and characteristic plant of Walter's territory, flowering in the south at the break of winter or the opening of spring (whence Walter's name *Cornucopiae hyemalis* and Bicknell's *Agrostis antecedens*), is thoroughly distinct from the plant of general Canadian, Alleghenian and transcontinental range, but extending only rarely into the coastal plain southward, which Willdenow described as *A. scabra*.

Personally, I do not know any acute field-botanist, familiar with the two plants, who does not at once distinguish them. Bicknell, as acute an observer as any who has worked on the flora of New York and New England, clearly understood them, though he failed to emphasize some characters which have later come to light; and another of our most accurate field-botanists (but far more conservative than Bicknell), discussing *A. antecedens*, "proposed by a most discriminating botanist," pointed out the different branching, "smaller spikelets more clustered at the ends of the short branchlets" and the "flowering period distinctive" (Bayard Long in Bartonia, no. 8: 17 (1924)). The differences between the two species are shown photographically in Rhodora, xxxv. t. 246 (1933).

Similarly, other sound species, obviously not clearly understood by the author, are suppressed, with the result, already noted, that the treatments of different genera are very unequal.

In looking over the keys one is at once impressed with the frequent dependence upon variable characters of pubescence and similar points, rather than upon more stable morphological characters. In the key to *Bromus*, for instance, *B. ciliatus* comes under a division (p. 34),

> Lemmas pubescent along the margin and on lower part of the back, the upper part glabrous;

while *B. purgans* and *B. latiglumis* are contrasted with it under

> Lemmas pubescent rather evenly over the back, usually more densely so along the lower part of the margin.

For the unfortunate collector who happens to get hold of *B. purgans*, forma *glabriflorus* Wieg., with lemmas glabrous, "it is just too bad." There are beautifully definite morphological characters separating these three species of *Bromus* but they are not noted in the key and the descriptions. Incidentally, the embarrassing *B. purgans*, forma *glabriflorus* is not mentioned in the body of the work; the name may possibly be enumerated in the voluminous lists of synonyms at the end of the book. The objection to recognizing forms as such is rather general throughout the book. For instance, still using *Bromus* as illustrative, under *B. latiglumis* (p. 45) we find that "A form with densely canescent sheaths has been called *B. incanus* (Shear) Hitchc." A proper formal combination was available; see Rhodora, xxxv. 316 (1933).

The drawings illustrating genera have been noted as copied largely from earlier publications and being most satisfactorily illustrative. It would have been a great help to the user if equal care and direction had been given to the small inserts representing different species. With *Bromus* still before us, look at figs. 18–21 on pages 42 and 43; scarcely a diagnostic point is shown and the confident user is bound to wonder what are the differences. Very similarly with many other groups, the mere illustration of bits of similar inflorescences, without any attempt to display the distinctive characters, gives a specious assurance which will often mislead. How, for instance, will the inexperienced beginner know

whether his specimen should go with fig. 993, 994 or 997 (*Aristida*) or whether his *Paspalum* matches fig. 1227, 1229 or 1231?

The maps displaying ranges have been referred to. These are very small and rigidly confine themselves to the United States, so that in many cases they are not complete maps of the North American range. They give a very general idea of whether the plant is eastern, western, northern or southern but the satisfaction in most cases with a single dot somewhere near the geographic center of each state represented too often leads to a visualization which is far from accurate. *Triplasis purpurea* is characteristic along the Atlantic and the lower Great Lakes; but from Hitchcock's map it would be too easy to infer that it grows in the White Mountains of New Hampshire, in central New York (House says: "especially along the sea beaches of Long Island and Staten Island. Reported from the Great Lakes, Buffalo"), in the Alleghenies of Pennsylvania (Porter cites it for all Pennsylvania only from Presque Isle, on Lake Erie) and from the upland of central Ohio (Schaffner cites it only from shores of Lake Erie). In some cases, notably in *Panicum* and *Spartina*, the coastal distribution of many species is more satisfactorily indicated.

In nomenclature the International Rules are largely followed, but one departure from the SPIRIT (though not the letter) of the International Rules is conspicuous. All personal genitives used as specific names are decapitalized, the International Rules strongly urging, as a recommendation, the slight concession to good taste and scholarship embodied in the capital initial; but here we get *Bromus pumpellianus, suksdorfii, orcuttianus* and all the rest with undignified initials, so that one cannot help wondering if the author thinks that such decapitalization is recommended in the International Rules. Before and at the Cambridge Congress he emphasized that, if certain points were altered, he would accept and follow the Cambridge decisions. The points he urged were accepted. The wholly unjustifiable *Agropyron pauciflorum* (Schweinitz) Hitchc. (1933 or 1934) is maintained, in spite of the earlier *A. pauciflorum* Schur (1859). The violation of the "homonym rule," a rule for which Hitchcock stood at Cambridge, by the publication of *A. pauciflorum* (Schweinitz) Hitchc. was sufficiently elucidated in RHODORA, xxxvi. 417–419 (1934). But in the main the International Rules are followed. For an extended work emanating from Washington this is a welcome innovation.

Enough has been noted to make it clear that Hitchcock's Manual is bound to be a stimulating and provocative volume. The close students of grasses are too few and the inclination in many quarters is to leave them to the specialist. The drawing together into one volume of treatments of all the genera of grasses in the vast and highly diversified area of the United States is a tremendous advance. The very different interpretations of many of them by the author and by others who intimately know them in special and limited areas will lead to a healthy re-study and re-evaluation of many which are now debatable. The bibliographic material is now before us for further and critical consideration. For thus assembling it our most cordial thanks are extended to Professor Hitchcock.—M. L. F.

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Una F. Weatherby del.

Varieties of CYSTOPTERIS FRAGILIS in eastern North America.

Rhodora

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A NEW VARIETY OF CYSTOPTERIS FRAGILIS AND SOME OLD ONES

C. A. Weatherby

(Plate 383)

Cystopteris fragilis (L.) Bernh., var. **protrusa**, n. var., rhizomate longe repents, basibus frondium decisarum sparse tantum onusto, apice vix paleaceo ultra frondes viventes 2–4 cm. producto; lamina adulta 11–22 cm. longa, 5–11.5 cm. lata, fere bipinnato-pinnatifida, pinnis ovatis vel ovato-lanceolatis acutis, pinnulis basin versus pinnarum deltoideo-ovatis vel ovato-lanceolatis subacutis plerumque breviter sed evidenter marginato-petiolulatis, profunde pinnatifidis, lobis oblongis obtusis, in lamina juvenili vel depauperata levius incisis obtusioribusque; indusio brevi, c. 0.5 mm. longo, apice leviter lobato vel fere integro. Tab 383, figs. 1 et 5.

Rootstock creeping, only sparsely beset with bases of old fronds, the growing point hardly paleaceous, produced 2–4 cm. beyond the fronds of the season; well-developed blades nearly bipinnate-pinnatifid, 11–22 cm. long, 5–11.5 cm. wide, pinnae ovate to ovate-lanceolate, acute, pinnules toward the base of the pinnae deltoid-ovate to ovate-lanceolate, subacute, usually shortly but distinctly petiolulate, deeply pinnatifid into oblong, obtuse lobes; in juvenile or depauperate blades less lobed and more obtuse; indusium about 0.5 mm. long, shallowly lobed or nearly entire at apex. Southern New York, south in the piedmont and the mountains to Alabama, west to Minnesota and Missouri. Apparently in alluvial or loamy soil in woods. New York: Bloodroot Valley, Staten Island, July 14, 1905, *Dowell* 3884. Maryland: near Cabin John, Montgomery Co., Aug. 1, 1920, *Maxon* 6495. District of Columbia: High Island, June 23, 1897, *Holm*. North Carolina: Old Fort, *W. Faxon;* near Swannanoa Tunnel, Buncombe Co., July 8, 1898, *Biltmore Herb.* 144[c]. Ohio: without definite locality, *J. G. Lea;* Cambridge, July, 1896, *Caro M. Taylor;* near Cincinnati, June 8, 1888, *J. G. Lloyd*. Indiana: Harrison tp., Wells Co., July 21, 1907, *Deam* 2323. Kentucky: prope North Bend, *Short;* Hawesville, Hancock Co., June 9, 1920, *E. J. Palmer* 17800; near

Vertrees, Hardin Co., Sept. 6, 1927, *Wherry & Pennell* 13632. TENNESSEE: Knoxville, June 5, 1898, *Ruth* 564 (TYPE, in Gray Herb.). ALABAMA: ravine along Black Warrior River, Tuscaloosa Co., April 14, 1929, *E. J. Palmer*, no. 35,373. ILLINOIS: Grand Tower, May 9, 1902, *Gleason*. MINNESOTA: Spring Grove, June 8, 1902, *Rosendahl* 404. MISSOURI: Worth, Worth Co., May 19, 1929, *E. J. Palmer* 36776; Joplin, Jasper Co., May 1, 1922, *Palmer* 21036; Carthage, July 12, 1910, *Palmer* 3018; Creve Coeur Lake, June 12, 1904, *W. W. Lyon*. Specimens from near Knoxville, Tennesse, June 5, 1929, *Wherry & Benedict* and from Muscle Shoals, Alabama, May 8, 1929, *Wherry*, show transitions to var. *Mackayii*.

Var. *protrusa* was detected some years ago by the keen eye of Prof. Fernald and by him was brought to my attention. It is the best marked of the four geographic variants of *C. fragilis* which can be recognized in eastern North America, being generally rather well distinguished by its combination of creeping rootstock, short-petiolulate basal pinnules and short indusium. Except for the transitions by which it is connected with var. *Mackayii* (to be discussed below) and through it with typical *C. fragilis*, it might almost pass for a species. It probably formed at least part of the concept of *C. tenuis*, generally kept up as a species by the English fern-specialists of the mid-nineteenth century—at least, that was usually described as having a creeping rootstock (cf. Moore, Nature-Printed Brit. Ferns, 8° ed., ii. 261 (1859)). The Short and Lea specimens cited above were originally determined as *C. tenuis*. Judging from his description, Milde (Fil. Eur. 153 (1867)) had a specimen of it from Pennsylvania; but it must have lacked a rootstock, for he could find no distinguishing character in it except the short indusium, which he duly noted. Var. *protrusa* is not, however, *Nephrodium tenue* Michx., the nomenclatural base of *C. tenuis;* that, as shown by a photograph of the type before me, is var. *Mackayii*.

The following key attempts to place var. *protrusa* in relation to the other geographic variants of *C. fragilis* in eastern North America. It is presented with the caveat that too much is not to be expected of it. Clear definition in this group is not easy. Leaf-form varies widely both within and between varieties. The characters of the indusium are none too constant and, in any case are hard to make out because of the fragility of that organ and the consequent difficulty of getting good dissections.[1] The key, then, in all probability will not

[1] So much is this the case, that of all the illustrations of *C. fragilis* which I have seen, only those of the always accurate and painstaking Christian Schkuhr truly represent the indusium. The almost scale-like character which he ascribes to *Aspidium tenue*, as he called it, can be perfectly matched in young specimens in the Gray Herbarium. Cf. Schkuhr, Krypt. Gewächse, pls. 53b, 54.

furnish the means of naming *every* specimen in this variable complex; nor does the treatment which it sets forth settle all questions which may arise.[1] But I believe it does indicate real foci of geographic segregation.

a. Rootstock oblique or horizontal, short, or, if elongate, thickly beset with bases of old fronds, the growing point usually conspicuously paleaceous, not produced horizontally beyond the fronds of the season; basal secondary segments usually sessile (subpetiolulate in large fronds of var. *Mackayii*) . . . . *b.*
b. Indusium relatively large, up to 1 mm. long, more or less deeply cleft at apex; at least the basal secondary segments of the blade not evenly cuneate at base, from nearly orbicular to deltoid-lanceolate . . . . *c.*
c. Indusium glabrous; plant usually not more than 2.5 dm. in height . . . . *C. fragilis* (typical)
c. Indusium sparsely and minutely glandular on the back; plants usually larger, up to 5 dm. high . . . . var. *laurentiana.*
b. Indusium about 0.5 mm. long, shallowly lobed or nearly entire: blade often only pinnate-pinnatifid, the basal secondary segments cuneate at base, oblong to obovate, only shallowly toothed or lobed and with broad, rounded apex, if more deeply lobed often lanceolate or oblong-lanceolate . . . . var. *Mackayii.*
a. Rootstock long-repent, the growing point scarcely paleaceous, produced horizontally 2–4 cm. beyond the fronds of the season; basal secondary segments (pinnules) with a definite margined petiolule; indusium as in var. *Mackayii* . . . . var. *protrusa.*

Cystopteris fragilis (L.) Bernh. Schrader's Journal i, pt. 2, 26, t. 2, fig. 9 (1806). *Polypodium fragile* L. Sp. Pl. ii. 1091 (1753).[2]—Eurasia; in America across the North from Greenland to Alaska, south commonly to northern New England, the region of the Great Lakes (and perhaps sporadically farther in the East), Missouri, western Texas and southern California. The widely distributed collection, *Fernald, Wiegand, Bartram & Darlington* 4314, from Grand Falls, Newfoundland, July 10, 1911, may stand as representative of the American plant.

Linnaeus had no specimen of *Polypodium fragile* in his herbarium in 1753. The species rests on several unillustrated references to literature, including Linnaeus's own Flora Suecica and Flora Lapponica, and one to Plukenet's Almagestum, pl. 180, fig. 4. This represents, accurately enough, the commonest leaf-form in the species, with lance-ovate, acute pinnae and deltoid-ovate to deltoid-lanceolate sessile basal secondary segments, which are narrowed rather evenly

[1] For instance, the American specimens here referred to typical *C. fragilis* show a greater tendency to develop elongate, horizontal rootstocks than does Old World material at hand or than is indicated by European descriptions. But the American tendency is by no means uniform and appears to be associated with no other character; at present, I cannot see that it offers any clear basis for further segregation.

[2] For full European synonymy, see Luerssen in Rabenhorst, Krypt.-Fl. Deutschl. iii. 451 (1889).

from near the base to a blunt point. In the absence of a specimen, this figure should stand as the type of the species.

In eastern North America, the species shows two opposite extremes in leaf-form, to which Lawson, D. C. Eaton, Macoun & Burgess, Gilbert, Farwell and Clute have applied, probably correctly, names originally based on European material. These forms are:

Forma dentata (Dickson) Clute, Fern Bulletin xiv. 120 (1906). *Polypodium dentatum* Dicks. Fasc. Plant. Crypt. Brit. iii. no. 1, t. 7, fig. 1 (1793). Lamina scarcely more than pinnate-pinnatifid, secondary divisions only shallowly lobed and very obtuse, their lobes also obtuse. Distinguished from var. *Mackayii* only by its broad-based secondary segments and long indusia.

Forma angustata (Hoffmann) Clute, l. c. *Polypodium fragile angustatum* Hoffm. in Roemer & Usteri, Mag. Bot. ix. 11, fig. 14d (1790). Lamina pinnate-bipinnatifid, secondary divisions lanceolate, both they and their lobes acute.

In Missouri and Oklahoma, *C. fragilis* passes into an ill-defined but, in its extreme, striking form, with rather broadly deltoid obtuse pinnae, often more than half as wide as long, obtuse secondary segments, the outer often linear-oblong with nearly parallel sides, and, curiously, rather uniformly large and conspicuous sori. This resembles small fronds of *C. bulbifera* and has been taken for that species. It was long ago observed and described, but not given a name, by Milde[1] who had a specimen from Missouri collected by Engelmann and, though he could see little in his material of var. *protrusa,* considered this "Formam memorabilem, fortasse speciem distinctam." It may be worth designating as:

Forma **simulans**, f. nov., pinnis deltoideis, obtusis, segmentis secundi ordinis obtusis saepe anguste oblongis, soris magnis. A specimen in the Gray Herbarium collected in woods, La Grange, Missouri, Sept. 14, 1911, *John Davis,* may serve as type.

Rarely, and rather evidently as a response to unusual conditions of growth (such as, perhaps, the burying of the plant under leaf-mold or earth), typical *C. fragilis* produces repent rootstocks as long and as sparsely beset with old leaf-bases as in var. *protrusa.* Macoun & Burgess (Trans. Roy. Soc. Can. 1884. 214) record one case, at London, Ontario (presumably, but not quite necessarily, referable to the typical form) in which the rootstock was a foot long and branched. Even so, the rootstock is not produced beyond the fronds of the season. D. C. Eaton's figure (Ferns N. Am. ii. pl. 53, fig. 1 (1879)) was evidently drawn from an aberrant plant of this sort. The ap-

[1] Fil Eur. 154 (1867).

parent clavate projection beyond the frond-base is, as close inspection of the drawing and similar material (Selkirk Mts., British Columbia, *Shaw* 1095) in the Gray Herbarium show, not really part of the rootstock, but a cluster of young fronds.

Var. LAURENTIANA Weatherby, RHODORA xxviii. 130 (1926). Originally known only from the region about the Gulf of St. Lawerence, but recently discovered at three localities in the Bruce Peninsula, Ontario—Driftwood Cove, Tobermory, Aug. 21, 1933, *T. M. C. Taylor* 6109; Stokes Bay, July 3, 1934, *Taylor* 9586; Barrow Bay, Aug. 25, 1934, *Krotkov* 9590.

Var. MACKAYII Lawson, Fern Flora of Canada, 233 (1889). *Nephrodium tenue* Michx. Fl. Bor.-Am. ii. 269 (1803). *Aspidium tenue* Sw. Syn. Fil. 58 (1806); Schkuhr, Krypt. Gewächse 196, t. 53b (at least as to left-hand figure and indusium) (1815). *Athyrium tenue* Presl Rel. Haenk. i. 39, in obs. (1825). *Cystopteris tenuis* Desv. Mém. Soc. Linn. Paris vi. 263 (1827). *C. Filix-fragilis*, var. *tenuis* Farwell, Rep. Mich. Acad. Sci. vi. 200 (1904), at least as to name-bringing synonym. Not *C. fragilis*, var. *tenuis* Milde, Fil Eur. 149 (1867).—Nova Scotia and southern Quebec to Virginia and occasionally westward to Wisconsin, Illinois, Missouri and the Black Hills of South Dakota. The prevailing form in southern New England; apparently not common elsewhere—Representative specimens are as follows. QUEBEC: Cleveland, July 20, 1923, *Chamberlain & Knowlton*. NEW BRUNSWICK: Grand Manan, Aug. 11, 1926, *Weatherby* 5600. NOVA SCOTIA: near West River, Lime Rock, Pictou Co., July 21, 1875 and northeast of Mt. Dalhousie, Pictou, Sept. 16, 1876, *Mackay;* George River, Aug. 29, 1920, *Bissell & Linder* 19471. MAINE: Cascade Brook, T. XVIII, Range 10, July 21, 1893, *Fernald* 208. NEW HAMPSHIRE: Gap Mt., Troy, May 30, 1898, *Rand & Robinson* 1028. VERMONT: Hartford, July 23, 1890, *Kennedy*. MASSACHUSETTS: Granville, June 26, 1914, *Seymour* 204. CONNECTICUT: Gaylordsville, July 14, 1887, *Holden*. NEW YORK: Thousand Island Park, Jefferson Co., July 2, 1902, *Robinson & Maxon* 76; Ithaca, June 18, 1916, *Wiegand* 5392. DELAWARE: Mt. Cuba, July 13, 1873, *Commons*. VIRGINIA: Stony Man Mt., Aug. 19, 1901, *Steele* 141. ILLINOIS: Starved Rock, La Salle Co., June 1–7, 1909, *Greenman, Lansing & Dixon* 168. SOUTH DAKOTA: Williams, Black Hills Region, Aug., 1891, *Thornber*.

A weaker variety than var. *protrusa*, depending on the association of short indusia and cuneate-based basal secondary segments and on its concentration in a geographic area lying between the regions inhabited by the typical form and that variety. In other respects also, such as the indusium and a tendency, in its larger forms to develop somewhat petiolulate segments, it forms somewhat of a transition between the typical form and var. *protrusa*.

I have not seen Lawson's type, but material furnished Davenport

by Mackay and now in the Davenport Fern Herbarium is presumably authentic. As previously noted, there is no doubt that Michaux's *Nephrodium tenue*, from southern Quebec, belongs here, though his name cannot be used in the varietal category.

Where *C. fragilis*, forma *magnasora* Clute, Fern Bulletin ix. 65 (1901) belongs, I do not know.

EXPLANATION OF PLATE 383

Fig. 1, Frond of *Cystopteris fragilis*, var. *protrusa* × 1/2; 1a, pinna of the same × 1, both from *Biltmore Herb.* no. 144c; 2, pinna of var. *Mackayii* × 1, from a specimen collected at Hartford, Vermont, by *Kennedy;* 3, pinna of *f. simulans* × 1, from the type specimen; 4, pinna of typical *C. fragilis*, × 1, from a specimen collected by Collins & Fernald at Rivière du Loup, Quebec; 5, indusium of vars. *Mackayii* and *protrusa*, approximately × 20; 6, indusium of typical *C. fragilis*, approximately × 15. Both indusia after Schkuhr.

GRAY HERBARIUM.

CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY—NO. CIX.

MIDSUMMER VASCULAR PLANTS OF SOUTHEASTERN VIRGINIA

M. L. FERNALD

(Plates 384–405)

STIMULATED by the success of the brief botanical trip to Princess Anne and Norfolk Counties, Virginia, made by Mr. Griscom and me in September, 1933, and reported upon in the paper, *Three Days of Botanizing in Southeastern Virginia*,[1] I induced Mr. Bayard Long to join me for a midsummer trip to the same area in 1934. Mr. Griscom being then in Europe it was necessary to forego his always cheerful and stimulating companionship. Accompanied by my son, Mr. Henry G. Fernald, as chauffeur and photographer, Mr. Long and I reached Virginia Beach on July 27. We had expected to stay four or five days but the pressure of interesting plants and those new to the area forced us to prolong the stay until August 9; and even then, on our last half-day in the field we brought in more than a score of species not previously reported from Princess Anne County. When we left, therefore, we were fully aware of the vast amount of exploration still needed and the desirability of further studies in the region.

[1] Fernald & Griscom, RHODORA, xxxvii. 129–157, 167–189, plates 332–351. Contrib. Gray Herb. no. cvii (1935).

The hot midsummer days, with temperatures daily reaching or exceeding 37.7° C (100° F) and an atmospheric humidity near 80, are the feast-times of chiggers (red-bugs) and ticks. Consequently, the call for a minimum of clothing, coupled with the necessity for perfect protection against invaders, strongly convinced us that, climatically at least, the region was one in which the austro-riparian flora should luxuriate. Kearney, in his very detailed study of the area, *Report on a Botanical Survey of the Dismal Swamp Region*,[1] has already so satisfactorily described the country, its climate and vegetation that it is necessary here merely to refer to that preliminary publication. Covering a vastly greater area than we and concentrating on the Dismal Swamp, which we barely reached in our westernmost collecting, Kearney had a broad outlook upon the whole flora but, naturally, he could not detect local spots of great interest but limited extent which we were able to find. Other such spots are doubtless numerous but as yet undetected by the botanist; and, surely, many areas once of great botanical interest are now hopelessly lost to the botanist through the deep ditching which has generally prevailed. Thus, the extensive area of the Green Sea, thence across the formerly wet stretch of almost uninhabited country between Grassfield and Cornland, the area at the northeast edge of the Dismal Swamp, bounded by Wallaceton, Northwest, Great Bridge and the Herring Canal, must originally have been a region of boggy pinebarren; but today, wherever not under cultivation, it is a hopelessly uninteresting cane- or reed-brake. By sheer good luck we got into one limited spot in this area which had not yet quite dried out. Here the Savannah or Pond Pine, *Pinus serotina* Michx., a species not seen by Kearney, still persists in spite of the draining; and in this remnant of a once extensive area of wet barrens we found the last lingering relics of the original flora: *Panicum lucidum* Ashe, *Cyperus retrorsus* Chapm., var. *Deeringianus* (Britton & Small) Fern. & Griscom, *Rynchospora microcephala* Britton, *R. gracilenta* Gray, *Carex venusta* Dew., var. *minor* Boeckl. and *Ludwigia pilosa* Walt. and *L. linearis* Walt., all but the last species not seen by Kearney. Many species of wet or dry pinebarrens, unsupported by modern (or? any) authenticating specimens, have been included in our northern Manuals as occurring in southern Virginia (*Mayaca Aubleti* Michx., *Syngonanthus flavidulus* (Michx.) Ruhl., *Bartonia verna* (Michx.) Muhl., etc.). It is quite clear that the proper habitats for such plants have been largely exterminated through draining and subsequent cultivation of the land.

[1] Thomas H. Kearney, Contrib. U. S. Nat. Herb. v. no. 6, pp. 321–585 (1901).

Another factor which is rapidly destroying the remnants of native vegetation which still linger in southeastern Virginia is the universal custom of turning rich woodlands into pig-pastures or dumps. So long as Man feels as he generally does, that the earth and its natural products were God-given to Man for his personal exploitation and destruction it is perhaps hopeless to expect any of Nature's wonderful gifts to be preserved for later generations. But it is not man and pig alone who are making the havoc. The ubiquitous and unrestrained Japanese Honeysuckle, *Lonicera japonica,* is doing its utmost to strangle everything which originally grew in the borders of wooded swamps or thickets. Even the strongly armored species of *Smilax* become hopelessly entangled by it and more delicate shrubs and herbs are soon obliterated. If the "CCC" survives, nothing more beneficial to future generations in our Southeast could be devised than a vigorous warfare against the Japanese Honeysuckle, the ruthless and exterminating "yellow peril" of the South.

Other limited areas with highly specialized floras were found. As distinctive as any is a small patch of peaty, sandy and slightly boggy swale between the backs of the coastal dunes and the fresh-water ponds south of the Rifle Range, below Rudy Inlet (between Virginia Beach and Dam Neck). Search from Cape Henry to the North Carolina border, below False Cape, has failed to reveal another spot like it, with its concentration of local plants of damp sands and peats, the following of them not reported by Kearney from this region of Virginia: *Axonopus furcatus* (Flügge) Hitchc., *Panicum ensifolium* Baldw., *Gymnopogon brevifolius* Trin., *Rynchospora rariflora* (Michx.) Ell., *R. cymosa,* var. *globularis* Chapm., *R. Wrightiana* Boeckl., *Juncus Elliottii* Chapm., a remarkable new *Hypoxis,* not closely related to other American species, *Sabatia gracilis* (Michx.) Salisb., and *Lobelia Nuttallii* R. & S.

Farther south, in the damp depressions in the sand between Back Bay and the dunes of False Cape is another area of localized coastal plain plants, the following noteworthy as not in Kearney's report from the county: *Cyperus Haspan* L., *Dichromena colorata* (L.) Hitchc., *Eleocharis albida* Torr. and *E. Lindheimeri* (Clarke) Svenson (extension east from Texas), *Rynchospora caduca* Ell., *Juncus megacephalus* M. A. Curtis, *Ranunculus hederaceus* L., *Ludwigia brevipes* (Long) E. H. Eames, *Hydrocotyle ranunculoides* L. f. and, extended south from the head of Chesapeake Bay, *Limosella subulata* Ives.

The rich woodlands, as already noted by Mr. Griscom and me,

Photo. E. C. Ogden.

Asplenium platyneuron: fig. 3, pinnae, × 1.
A. platyneuron, var. euroaustrinum: fig. 1, plant, × ⅖; fig. 2, pinna, ×1.

Photo. E. C. Ogden.

Sagittaria Weatherbiana: fig. 1, flowering plant and separate inflorescence, × ½ (type); fig. 2, dilated filaments and anthers, × 10, from type; figs. 3–6, mature achenes, × 10.

contain many species of the interior most unexpected on the outer edge of the coastal plain, close to the Atlantic. Several such species are enumerated by Kearney. Our browsings brought to light many other plants of rich woods, several of them amazingly remote from their inland centers: *Thelypteris hexagonoptera* (Michx.) Weath., *Panicum Boscii* Poir., *Liparis liliifolia* (L.) Richard, *Goodyera pubescens* (Willd.) R. Br., *Aristolochia Serpentaria* L., *Arenaria lanuginosa* (Michx.) Rohrb., *Aquilegia canadensis* L., *Asimina triloba* (L.) Dunal, *Agrimonia parviflora* Ait. and *A. mollis* (T. & G.) Britton, *Angelica villosa* (Walt.) BSP., *Sabatia brachiata* Ell., *Galium uniflorum* Michx., *Vernonia glauca* Willd. and *Antennaria Parlinii* Fern., *A. fallax* Greene and *A. solitaria* Rydb. Isolation from the interior is well illustrated by *Vernonia glauca*, a characteristic plant, as Small expresses it, of "Wooded slopes and riverbanks, various provinces N of Coastal Plain, Ga. to Ala., Pa. and N. J." Yet in the woods near Little Creek it is less than a mile from the sea.

From these introductory notes it will be apparent that the southeastern counties of Virginia still support a flora of real interest, one which we are just beginning to know, although the activities of Man have severely diminished it. In view of the very detailed list already published by Kearney it will be useful to have on record all species collected by us which he did not record from our limited area (Princess Anne and Norfolk Counties) and which were not recorded in the paper by Griscom and me. The numbers cited are of herbarium specimens collected as vouchers. We spent one night before reaching Virginia Beach at Wachapreague in Accomac County. Although Accomac County is north of the entrance to Chesapeake Bay a few records of range-extensions there are here included. In a few cases additional stations discovered by Mr. Griscom and me in September, 1933 (and not previously reported) or in May, 1935, or by Griscom, Long and myself in June, 1935, are included; but in the main the later collections await further study before a report upon them will be justified.

The accompanying report contains numerous technical plates, the photographs, chiefly by Mr. E. C. Ogden, made possible through a grant from the Milton Fund for research of Harvard University. The expense of their reproduction has been most generously met by Mr. Bayard Long.

Enumeration of Noteworthy Species Collected[1]

Thelypteris noveboracensis (L.) Nieuwl. Frequent, often abundant, in rich woods, both counties: Little Neck, Princess Anne Co., no. 3608.

T. palustris Schott, var. pubescens (Lawson) Fern. Swamps or inundated woods, frequent in both counties: north of Blackwater River, no. 3610.

T. hexagonoptera (Michx.) Weath. Moist or swampy woods, Little Neck, no. 3609. Seen in 1935 in abundance on Great Neck and nearer Virginia Beach.

Asplenium platyneuron (L.) Oakes. Frequent in woodlands, northern half of Princess Anne Co.: rich woods east of Little Creek, no. 3602.

Asplenium platyneuron (L.) Oakes, var. **euroaustrinum**, var. nov. (tab. 384, figs. 1 et 2), frondibus fertilibus submembranaceis 2–5 dm. longis 3–7.5 cm. latis; pinnis anguste lanceolatis apice acutis vel subacutis valde serratis; soris maturis distinctis non confluentibus.—Florida to Louisiana, north to Kentucky and southeastern Virginia. Type: rich, mixed woods, Munden, Princess Anne Co., Virginia, August 1, 1934, *Fernald & Long*, no. 3603 (in Gray Herb.).

Var. *euroaustrinum* is the extreme development, gigantic for the species, in the warm region of the southeastern United States. Its most important character is in the remote sori which, when fully ripe, remain distinct, instead of becoming promptly confluent as in the wide-ranging typical *Asplenium platyneuron*. The latter is frequent to common in eastern Virginia in good soils; but var. *euroaustrinum* was seen by us only in woodlands of most austral aspect at the extreme southeastern corner of the state but it was collected by Heller in Southampton Co., about Franklin, *Heller*, no. 1147. All material in the Gray Herbarium from Florida belongs to var. *euroaustrinum*. For comparison mature pinnae from typical *A. platyneuron*, our no. 3602, from east of Little Creek, Princess Anne Co., is included in the plate as fig. 3.

I am retaining *Asplenium platyneuron* (L.) Oakes in order to avoid further changes in the nomenclature of the common species which for two generations has been passing under that name. The history and the application of the name are about as shaky as any of the Linnean definitions of American plants, based upon confused and quite inadequate knowledge. Nomenclaturally *Asplenium platyneuron* rests upon *Acrostichum platyneuron* L. Sp. Pl. ii. 1069 (1753), a treatment copied directly (with the omission of the original diagnosis) from the

[1] Unless otherwise designated the collectors are *Fernald & Long;* the collections of *Fernald & Griscom* are cited as of *F. & G.;* those of *Fernald, Griscom & Long* as of *F. G. & L.*

dissertation on *Acrostichum* of Linnaeus's pupil, Johann Benjamin Heiligtag, and published in L. Amoen. Acad. i. 156 (1749).

The treatment in Heiligtag's dissertation was as follows:

> 10. *ACROSTICHUM frondibus pinnatis, pinnis alternis ovatis crenatis sessilibus sursum arcuatis. Gron. virg.* 123.
>
> *Filix Polypodium dicta minima virginiana platyneuros. Pluk. alm.* 153. *t.* 289. *f.* 2. *Raj. app.* 58.
>
> *Asplenium virginianum, polypodii facie. Raj. app.* 59.
>
> *Polypodium minus virginianum, foliis brevibus subtus argenteis. Moris. hist.* 3. *p.* 563. *s.* 14. *t.* 2. *f.* 6.
>
> Habitat in *Virginia.*
>
> *Facies* Polypodii officinarum.
>
> *Stipites* nudi, alterni, palmares.
>
> *Frons* pinnata lobis alternis, obtusis, integerrimis, obverse ovatis, aut oblongis, sursum arcuatis, basi coadunatis; aversa foliorum pars alba pulvere ferrugineo adspersa.
>
> *Morisoni* datum synonymon huc spectat, licet ipse hoc idem conjungat cum specie octava.

The account in Species Plantarum was essentially identical but ended with "*Habitat in* Virginia."

Taking up the citations as they are given in Species Plantarum, the first, *Acrostichum frondibus alternatim pinnatis, foliolis ovatis crenatis sessilibus, sursum arcuatis* of Gronovius, was based primarily upon Clayton's no. 14 (*Trichomanes foliis minoribus, caule nigro splendente*). The Clayton specimen, studied by Asa Gray in 1839, was recorded by him on the margin of the copy of Gronovius used by him for that purpose as *Asplenium ebeneum* Ait. That identification, the only satisfactory evidence that *Acrostichum platyneuron* was an *Asplenium*, was promptly taken as typifying the species; and, since this typification was accepted without question by Moore, Hooker, D. C. Eaton and others, it is better to let it so stand.

The other bases of *Acrostichum platyneuron* are wholly a sad mixture of *Polypodium virginianum* L. and *P. polypodioides* (L.) Watt. *Filix Polypodium dicta minima Virginiana platyneuros* of Plukenet, from which the specific name *platyneuron* was, obviously, taken, rests on a conventionalized figure of a *Polypodium virginianum*. This figure shows a rachis somewhat exaggerated by shadow, which could well be described "platyneuros." Ray took over the Plukenet species and added to the citation "*vide* Asplenium Virginianum Polypodii facie *D. Pet.*" This plant, the 2nd listed by Linnaeus as identical with that of Clayton (or Gronovius), was well described by Ray as a hand's breadth high, with the pinnae as in *Polypodium*, the fruit as in *Asplenium* (possibly meaning something quite outside our present

Asplenium), the fruiting side of the frond whitish and roughened with ferruginous dots (Seminalia autem exanthemata ferruginei coloris non sunt sed albicantes punctulis ferrugineis aspera). The latter character could have been drawn only from *Polypodium polypodioides;* yet Ray went on to state that his species is Plukenet's *Filix Polypodium dicta minima Virginiana platyneuros,* already shown to be the smooth *P. virginianum.* Morison's *Polypodium minus virginianum, foliis brevibus subtus argenteis* was likewise undoubted *P. polypodiodes;* the figure is unequivocal and the description is perfect.

Returning to the original (or compiled) diagnosis in the dissertation on *Acrostichum,* it is clear that Linnaeus and his student, Heiligtag, were confused: "*Facies* Polypodii officinarum" was certainly a sufficient indication of *Polypodium;* "*Stipites* nudi, alterni, palmares" actually describes the stipes of *Polypodium virginianum,* not the very short and tufted stipes of the *Asplenium;* "lobis . . . integerrimis, obverse ovatis . . . sursum arcuatis" is perfectly good for *Polypodium,* not for the *Asplenium;* and surely "aversa foliorum pars alba pulvere ferrugineo adspersa," the phrase taken right out of Ray, could apply to nothing but *Polypodium polypodioides.*

If we typify *Acrostichum platyneuron* by most of the literary references and by the clear but compiled diagnosis in Amoen. Acad. we can arrive only at a mixture of *Polypodium virginianum* and *P. polypodioides,* both bearing Linnean specific epithets dating from 1753. Only by ignoring all the confused and quite misunderstood references to *Polypodium* and putting the weight on the plant of Clayton which Gronovius described, which Linnaeus studied (but misunderstood) and which Gray, Moore, Hooker and others selected as the true basis of *Acrostichum platyneuron,* can we save the name in its current application. In view of the consensus of good usage it is wisest to let it so stand; but the case is a perfect one to place before those philosophical but usually botanically inexperienced enthusiasts who think that typification or elucidation of the muddled concepts of early authors can be properly accomplished by means of a single RULE. A rule which in one case would conserve an established usage in another would do the opposite, unless we can agree that in these old and obscure medleys typification was accomplished by the student who first selected one element to stand as typical. Such a rule as that would conserve most names. A rule which arbitrarily designates the first citation or the first plate or the diagnosis would often do havoc to usage. The diagnosis of *Acrostichum platyneuron,* for example, applies not to *Asplenium* but to two species of *Polypodium.*

ATHYRIUM ASPLENIOIDES (Michx.) Desv. Common in moist woods and swamps, highly variable in size, attenuation of pinnae and color (green or rufescent): Little Neck, nos. 3604, 3605; Oceana, no. 3606.

BOTRYCHIUM VIRGINIANUM (L.) Sw. Rich woods, occasional in both counties: Little Neck, no. 3612; east of Little Creek, *F. & G.*, no. 4291; near Benefit, *F. & G.*, no. 4292.

All the material has more oblong and blunter pinnules than the plant of the Northeast and of the Alleghenian region. It is presumably typical *B. virginianum*, the type of which is now being compared with it in London.

B. DISSECTUM Spreng. Dry, mixed woods, Little Neck, no. 3613.

B. DISSECTUM, forma OBLIQUUM (Muhl.) Fern. With the latter, no. 3614.

LYCOPODIUM INUNDATUM L., var. BIGELOVII Tuckerm. Damp or wet peaty or sandy depressions near the coast: The Desert, Cape Henry, no. 3615; Rifle Range, south of Rudy Inlet, no. 3616.

PINUS SEROTINA Michx. Common in wet peaty soil of southern Norfolk Co., from the northeast corner of the Dismal Swamp eastward across the Green Sea: south of Grassfield, no. 3618.

TYPHA ANGUSTIFOLIA L., var. ELONGATA (Dudley) Wiegand (var. *virginica* Tidestrom.). Marshes and margins of ponds and creeks, Princess Anne Co.: margin of Owl Creek, Virginia Beach, no. 3621.

One of Tidestrom's original collections of his var. *virginica* was from Cape Henry.

TYPHA TRUXILLENSIS HBK. Nov. Gen. et Sp. i. 68 (1815). *T. latifolia *domingensis* Pers. Syn. ii. 532 (1807). *T. domingensis* (Pers.) Kunth, Enum. iii. 92 (1841). VIRGINIA: border of salt marsh by Back Bay, Munden, no. 3623; border of Nowney Creek, Back Bay, *F. G. & L.*, no. 4530. NORTH CAROLINA: brackish marsh of Back Bay, east of Morse Point, Currituck Co., no. 3622, *F. G. & L.*, no. 4529.

Typha truxillensis is very conspicuous on the brackish marsh, near the causeway leading from south of Munden to Knott's Island, North Carolina and Virginia. It there grows in intimate association with *T. angustifolia* L., and the contrast between the two could hardly be better demonstrated: *T. angustifolia* comparatively low, with few dark-green, subherbaceous, plano-convex leaves and deep reddish-brown spikes; *T. truxillensis* twice as tall, the 10± very pale and coriaceous flat leaves overtopped by the whitish-brown spikes, so very tall as to give special point to two of the names under which it has passed: *T. gigantea* Schur (1865) and *T. maxima* Schur (1905). After collecting and photographing *T. truxillensis* within the limits of North Carolina we made a point of visiting the marshes of Back Bay slightly to the north, within Virginia, where it is equally abundant.

In mid-June, 1935, it was barely in anthesis, whereas *T. latifolia* and *T. angustifolia* were in young fruit (with staminate flowers shriveled).

Typha truxillensis (as *T. domingensis*) is recorded by Graebner in Engler's Pflanzenr. iv[8]. 14 (1900) from temperate[1] and tropical South America, Central America and the West Indies, northward to southern California, Texas and Louisiana. It is in the Gray Her-

[1] In view of the abundance of *Typha truxillensis* (*T. domingensis*) in temperate South America, it is difficult to understand the statement of Mr. J. Hutchinson (Fam. Fl. Pl. ii. Monoc. 128 (1934)): "Typha; absent from America and Africa south of the equator." There are many specimens of *T. truxillensis* (often misidentified as *T. angustifolia* and even as *T. latifolia*) in the Gray Herbarium from southern Brazil, Uruguay and Argentina, from between lat. 30° and 35° S. In his *Contributions to the Flora of North Patagonia*, Journ. Linn. Soc. xxi. 236 (1884), John Ball wrote of it (as *T. angustifolia*): "Extends from the valleys of North Patagonia through the provinces of Buenos Ayres and Entrerios." A sheet of this material in the Gray Herbarium is typical *T. truxillensis*. But Ball's conclusion regarding the dispersal of "This cosmopolitan species" should be modified, since *T. truxillensis* is purely American. In 1894, Kronfeld in Martius, Fl. Bras. iii[3]. 642, gave the range of *T. domingensis:* "Habitat in Americae regionibus inter 35. circulum parall. longitudinis septentrionalis et Patagoniam sitis inclusa India occidentalis"; and he cited many specimens from south of the equator. Graebner in Pflanzenr. iv[8] gives *T. domingensis* a similar range: "südlich bis nach Buenos-Aires und Nordpatagonien." Our collections extend the range to lat. 36° 40′ N.

As to the absence of *Typha* from "Africa south of the equator," reference merely to *Index Kewensis*, Kronfeld's monographic study in 1889 and Graebner's treatment in Das Pflanzenreich would have been sufficient to show that *T. capensis* came from South Africa, that *T. latifolia*, proles *Hildebrandtii* occurs only on Madagascar and that *T. angustifolia*, subsp. *australis* grows in Zanzibar, the Transvaal and at the Cape of Good Hope!

Unfortunately others of Hutchinson's statements of the geographic areas occupied by groups have to be carefully checked or treated with easy-going liberality: for instance, his brief summaries under *Lophotocarpus* (p. 34), the *Xyridaceae* (pp. 61 and 63) and *Hemerocallis* (p. 91). The broad range of the *Xyridaceae* (the genus *Xyris*) is given: "Warmer regions of the world, usually in saline marshes; numerous species in Florida." I have personally known *Xyris* in the field for nearly half-a-century, but I never saw it in *saline* soil. Small, including the "numerous species [about 20] in Florida," rightly assigns them all fresh habitats, 15 of the species in "pinelands," which are not saline. Of the 28 species in *Flora Brasiliensis* only 1 is assigned a possibly maritime habitat (with no statement that it is saline). "Trop. and Subtropics," given as the range of *Xyris*, surely needs some qualification as a statement of the occurrence of a genus ranging from 42° S. lat. to 50° N. lat. Similarly "Tropics generally" for *Lophotocarpus*, which grows northward to northeastern New Brunswick (47° N., the latitude of the Loire, central Switzerland or the Tirol) and to Oregon, is not fully satisfactory; and "Hemerocallis (Calif.)" for a well-known Eurasian genus, which is found in California only in gardens, is inexplicable unless one supposes it to have arisen through confusion with the western American *Hesperocallis*, but in the same paragraph Hutchinson correctly assigns *Hesperocallis* to California. Every one may make occasional slips but, when such misstatements are numerous and put forward with seeming finality, they increase the reader's scepticism regarding the deductions drawn and the fundamental changes of classification proposed. The natural caution about following Hutchinson in removing *Allium* and its allies from the *Liliaceae* and transferring them to the *Amaryllidaceae* or in severing the *Resedaceae* from the *Papaverales* and placing them in the *Violales* seems justified. In some cases, however, Hutchinson puts a single genus into two groups: thus *Kyllinga* (p. 196) is placed in the tribe *Rynchosporeae* and also in the tribe *Cypereae*. If that is possible, why should not a genus belong to two families and a family to two orders?

barium also from Lee Co., Florida (*J. P. Standley*, no. 141). Its abundance about Back Bay indicates that in the Carolinas and Georgia it has presumably been confused with *T. angustifolia*.

SAGITTARIA FALCATA Pursh. Salt to brackish or fresh marshes and river-margins, seen at Munden and on the marshes of North Landing River and its tributary, Blackwater River: Munden, no. 3625.

This is doubtless the plant listed by Kearney as *S. lancifolia* L. *S. falcata* was long confused with the latter species of tropical and subtropical America; it has the bracts of the inflorescence short, blunt and coarsely papillate, whereas the bracts of *S. lancifolia* (known in Florida) are lance-attenuate, much-prolonged and smooth.

SAGITTARIA **Weatherbiana,** sp. nov. (TAB. 385 et TAB. 386, FIG. 1), planta 4–9 dm. alta; rhizomate breve et crasso, stolonibus elongatis apice tuberosis; foliis exterioribus membranaceis lineari-oblongis obtusis vel subacutis 1.5–2.5 cm. latis; foliis interioribus longe petiolatis, petiolo erecto 2–4.5 dm. longo crasso, basi dilatato-amplectante; limbo lanceolato vel oblanceolato vel elliptico utrinque acuminato 1.2–2.5 dm. longo 2.5–7.5 cm. lato submembranaceo perviridi 5–7-nervo; scapo erecto 3–6 dm. alto; inflorescentiis monoicis vel dioecis verticellis 3–6 remotis, flores longe et graciliter pedicellatis, pedicellis 2.5–6.5 cm. longis ante anthesin adscendentibus postea divaricatis; bracteis 3 scariosis ovato-acuminatis basi coalitis 5–10 mm. longis; sepalis ovatis 6–9 mm. longis, post anthesin reflexis; petalis obovatis lacteis 1–1.5 cm. longis; staminibus 12–18, filamentis complanatis basi dilatatis pubescentibus, antheris lineari-oblongis fere basifixis 2–2.5 mm. longis; carpellis maturis complanatis anguste et oblique cuneato-obovatis 2–2.5 mm. longis 1–1.5 mm. latis utrinque anguste alatis, alis tenuibus, parietibus costis 1–3 elongatis instructis vel ecostatis, stylo subulato vix 0.5 mm. longo.—Southeastern Virginia to eastern South Carolina. VIRGINIA: in water of gum swamp south of North Landing, Norfolk Co., August 7, 1934, *Fernald & Long*, no. 3624, disintegrating material, distributed as *S. cycloptera* (J. G. Smith) Mohr; open pools in gum swamp north of Land of Promise (same region as above), May 7, 1935, in flower, *Fernald & Griscom*, no. 4297, TYPE in Gray Herb.); same station, June 18, 1935, in overripe fruit, *Fernald, Griscom & Long*, no. 4536. NORTH CAROLINA: shallow water of roadside excavation, Washington, Beaufort Co., April 15, 1932, in flower, *Weatherby*, no. 6086, distributed as *S. lancifolia* L. SOUTH CAROLINA: marsh, Longwood Island, Waccamaw River, Horry Co., April 22, 1932, in flower, *Weatherby & Griscom*, no. 16,395, distributed as *S. lancifolia* L.

Sagittaria Weatherbiana has been confused, it will be noted, with both *S. cycloptera* and *S. lancifolia;* it is also somewhat allied to *S. graminea* Michx. and it superficially resembles *S. ambigua* J. G. Sm. From *S. graminea* with which, as well as with *S. cycloptera*, it shares

dilated filaments, it differs in its greater size in all parts, *S. graminea* having narrower and long-acuminate phyllodia; slender-petioled inner or later leaves, with blades very rarely up to 1.5 dm. long and 3 cm. broad; pedicels at most 3 cm. long; bracts blunt and at most 6 mm. long; anthers (PLATE 386, FIG. 2) ellipsoid or rounded and only 0.6–1 mm. long; achenes (PLATE 386, FIGS. 3–5) 1.5–2 mm. long. *S. graminea* flowers in the North (Newfoundland, southern Labrador and Ontario thence into the northernmost States) from late June to September, in the southern part of its range (Delaware, District of Columbia, southern Indiana, Missouri and Texas) from late May to August; *S. Weatherbiana* is one of the earliest species, flowering in April and early May, its mature achenes essentially all dropped by mid-June.

S. Weatherbiana in foliage closely simulates *S. ambigua.* That species of Missouri, Kansas and Oklahoma, however, has lance-attenuate, very slender-tipped and papillate bracts 1–1.5 cm. long and essentially free to the base; pedicels only 1.5–3.5 cm. long; filaments (PLATE 386, FIG. 6) filiform-subulate (not dilated below); and shorter and much more rounded achenes (PLATE 386, FIG. 7). *S. Weatherbiana* only superficially resembles *S. ambigua.*

The newly proposed species, when Mr. Long and I first collected it, was placed provisionally in *S. cycloptera*, awaiting adequate flowering and fruiting material. The differentiating characters are many: *S. cycloptera* has an elongate rhizome; narrow (3–12 mm. wide) and long-attenuate phyllodia; slender-petioled later leaves, with linear-lanceolate blades; pedicels 1–3 cm. long; anthers (PLATE 386, FIG. 8) 0.8–1.2 mm. long; and achenes (PLATE 386, FIGS. 9 and 10) with very conspicuously developed dorsal keel.

From *Sagittaria lancifolia* the more northern *S. Weatherbiana* differs in many characters. *S. lancifolia,* a tropical American species, unknown north of Florida, has coriaceous blades, firm lanceolate bracts up to 3 cm. long; pistillate pedicels shorter than to about twice as long as their subtending bracts; filaments (PLATE 386, FIG. 11) slender (not dilated); achenes (PLATE 386, FIGS. 12 and 13) 2.5–3 mm. long, with thickened dorsal keel; a species far removed from *S. Weatherbiana.*

The northeastern representative of *Sagittaria lancifolia* is *S. falcata* Pursh, extending north to Delaware and Maryland. Like *S. lancifolia* it has firm or coriaceous pale-green leaves, quite different from the dark-green and submembranaceous blades of *S. Weatherbiana.*

Photo. E. C. Ogden.

Sagittaria Weatherbiana: fig. 1, phyllodia, × 5/12.
S. graminea: fig. 2, anthers, × 10; figs. 3–5, achenes, × 10.
S. ambigua: fig. 6, stamens, × 10; fig. 7, achene, × 10.
S. cycloptera: fig. 8, stamens, × 10; figs. 9 and 10, achenes, × 10.
S. lancifolia: fig. 11, stamens, × 10; figs. 12 and 13, achenes, × 10.
S. falcata: fig. 14, stamens, × 10; fig. 15, achene, × 10.

Photo. E. C. Ogden.

Eleocharis ambigens: fig. 1, plant, × $\frac{2}{5}$; figs. 2 and 3, spikelets, × 4; figs. 4 and 5, summit of sheath, × 10; fig. 6, achene, × 10; fig. 7, achene, × 25; fig. 8, surface of achene, × 50.

E. uniglumis: fig. 9, spikelet, × 4; fig. 10, summit of sheath, × 10; fig. 11, achene, × 10.

E. halophila: fig. 12, spikelet, × 4; fig. 13, summit of sheath, × 10; fig. 14, achene, × 10.

Its bracts and sepals are obtuse and strongly papillose; its pistillate pedicels are only 0.5–2.5 cm. long; its filaments (PLATE 386, FIG. 14) are slender and longer than the anthers; and its falcate achenes (PLATE 386, FIG. 15) are only 0.7–1 mm. wide and tapering to erect beaks. *S. falcata* is a late-flowering species of brackish to fresh river- and pond-borders and marshes. In southeastern Virginia, the Carolinas and Georgia it flowers from July to September. In Princess Anne County, the day (June 18) we collected the deep-green *S. Weatherbiana* with its achenes mostly fallen, the pale-leaved *S. falcata*, at the margins of Blackwater and North Landing Rivers, had not developed sufficiently to show young flower-buds.

PUCCINELLIA FASCICULATA (Torr.) Bickn. Upper border of salt marsh, Wachapreague, Accomac Co., no. 3629.

Apparently an extension southward from Delaware.

GLYCERIA SEPTENTRIONALIS Hitchc. Shallow water of swampy woods throughout, flowering in May (or earlier), essentially unrecognizable in mid-June: south of North Landing, no. 3630 and *F. & G.*, no. 4308; Little Creek, *F. & G.*, no. 4307; near Cornland, *F. & G.*, no. 4309.

The profusion of *Glyceria septentrionalis* in the coastal-plain swamps of southeasternmost Virginia and its absence northeast of Massachusetts, suggests that is is a subaustral, rather than a boreal species.

TRIPLASIS PURPUREA (Walt.) Chapm. Sand dunes, Cape Henry, *F. & G.*, no. 2712.

CALAMAGROSTIS CINNOIDES (Muhl.) Bart. Frequent from the northeastern corner of the Dismal Swamp across the Green Sea: wet peaty clearings in woods of *Pinus serotina*, south of Grassfield, no. 3647.

POLYPOGON MONSPELIENSIS (L.) Desf. Fresh to brackish or saline swales, pond-margins and shores, with strictly indigenous associates and looking as native as they: Wachapreague, no. 3643; outlet of Rainey's Pond, Sand Bridge, no. 3644, *F. G. & L.*, no. 4550; Cedar Island, *F. G. & L.*, no. 4551.

The statements of habitat, "Waste places" and "Moist waste places," in our current manuals are most unsatisfactory for the plant of the Virginia coast, although on the coast northward to New England the plant has every appearance of a casual introduction.

SPOROBOLUS POIRETII R. & S. Roadsides, borders of fields and ditches, frequent: Little Creek, no. 3645; Knott's Island, no. 3646.

ARISTIDA OLIGANTHA Michx. Dry clay of open woods and thickets, north of Blackwater River, no. 3641.

A. LONGESPICA Poir. Dry open soil or open woods: north of Blackwater River, no. 3642; Cedar Hill, *F. & G.*, no. 2718.

Leptochloa filiformis (Lam.) Beauv. Border of brackish marsh near Kempsville, *F. & G.*, no. 2709.

Spartina cynosuroides (L.) Roth. Salt or brackish marshes, frequent: Kempsville, *F. & G.*, no. 2710.

Gymnopogon brevifolius Trin. Occasional in Princess Anne Co.: border of ditch, Macon's Corner, *F. & G.*, no. 2708; damp sandy and peaty depressions back of dunes, Rifle Range, south of Rudy Inlet, no. 3650.

Axonopus furcatus (Flügge) Hitchc. Princess Anne Co.: damp sandy and peaty depressions back of the dunes, Rifle Range, south of Rudy Inlet, no. 3663; dry open clay lands and thickets, Virginia Beach, no. 3664.

Paspalum laeve Michx., var. pilosum Scribn. (*P. longipilum* Nash). Pine woods near Macon's Corner, Princess Anne Co., *F. & G.*, no. 2730.

P. laeve, var. circulare (Nash) W. Stone (*P. circulare* Nash). Ditch by brackish marsh of North Landing River, Pungo Ferry, *F. & G.*, no. 2728.

P. setaceum Michx. Dry thicket near Cedar Hill, *F. & G.*, no. 2729.

P. setaceum Michx., var. supinum (Bosc) Trin. (*P. supinum* Bosc). Wet peaty depressions in sandy pineland, The Desert, Cape Henry, no. 3659; sandy woods, northern end of Knott's Island, Princess Anne Co., no. 3660.

A slight extension northward, from North Carolina. *Paspalum supinum* Bosc, like *P. longepedunculatum* LeConte, is surely too confluent with *P. setaceum* for specific recognition. By treating them as definite species taxonomic values are debased and the clarity of true species, of which there is an abundance, is obscured. *P. longepedunculatum* should stand, it seems to me, as *P. setaceum*, var. *longepedunculatum* (LeConte) Wood.

P. ciliatifolium Michx. Wet, peaty clearings in woods of *Pinus serotina*, south of Grassfield, no. 3658.

Panicum anceps Michx., var. rhizomatum (Hitchc. & Chase) Fern. (*P. rhizomatum* Hitchc. & Chase). Dry pinelands, Cape Henry, *F. & G.*, no. 2741.

P. agrostoides Spreng., var. condensum (Nash) Fern. (*P. condensum* Nash). Border of brackish marsh of North Landing River, Pungo Ferry, *F. & G.*, no. 2738.

P. aciculare Desv. Damp sands and peats or sandy woods, Princess Anne Co.: Cape Henry, no. 3693, *F. & G.*, no. 2748; Rifle Range, no. 3694; Sand Bridge, *F. G. & L.*, no. 4537.

P. angustifolium Ell. Dry or moist woods, common in Princess Anne Co.: Little Neck, no. 3695; Virginia Beach, no. 3697.

P. roanokense Ashe. Swales and damp sands, Rifle Range, south of Rudy Inlet, nos. 3667, 3668, 3675; boggy swale by Northwest River, Northwest, *F. G. & L.*, no. 4538.

P. LUCIDUM Ashe. Wet peaty clearings in woods of *Pinus serotina*, south of Grassfield, nos. 3670–3672; swampy or inundated woods, north of Blackwater River, no. 3673.

P. LANUGINOSUM Ell. Frequent in swampy woods and wet peat: north of Blackwater River, no. 3680; Princess Anne Courthouse, *F. & G.*, no. 2755.

P. LANUGINOSUM, var. SEPTENTRIONALE Fern. Swales back of the dunes, Rifle Range, south of Rudy Inlet, no. 3681.

P. VILLOSISSIMUM Nash. Occasional in Princess Anne Co.: damp sandy and peaty depressions back of the dunes, Rifle Range, no. 2699, *F. G. & L.*, no. 4543; dry mixed woods, Little Neck, no. 3700.

P. COMMONSIANUM Ashe, var. ADDISONII (Nash) W. Stone (*P. Addisonii* Nash). Damp sandy peats back of the dunes, Rifle Range, no. 3698; dry pine woods, Macon's Corner, Princess Anne Co., *F. & G.*, no. 2757.

P. COLUMBIANUM Scribn. Sandy borders of gum swamps in The Desert, Cape Henry, no. 3701.

P. SPHAEROCARPON Ell., var. INFLATUM (Scribn. & Sm.) Hitchc. Depressions in clay fields, Rosemont, no. 3676.

P. POLYANTHES Schultes. Frequent in peaty and sandy woods, thickets and clearings, both counties: south of Grassfield, no. 3677.

P. ENSIFOLIUM Baldw. Damp sandy and peaty depressions back of the dunes, Rifle Range, south of Rudy Inlet, nos. 3682, 3683, *F. G. & L.*, no. 4539.

P. BOSCII Poir., var. MOLLE (Vasey) Hitchc. & Chase. Dry, mixed woods, Little Neck, no. 3689.

TRIPSACUM DACTYLOIDES L. Frequent and conspicuous in dry fields and on roadsides, Princess Anne Co.: Munden, no. 3666.

CYPERUS RIVULARIS Kunth. Brackish marsh of North Landing River, Pungo Ferry, *F. & G.*, no. 2796.

C. SABULOSUS Mart. & Schrad. Frequent in damp soils, Princess Anne Co.: Kempsville, *F. & G.*, no. 2782; Rosemont, no. 3712; outlet of Rainey's Pond, no. 3713; Knott's Island, no. 3711.

C. COMPRESSUS L. Occasional: sandy roadside, North Landing, *F. & G.*, no. 2794; depressions in clay field, Rosemont, no. 3708; sandy woods, Knott's Island, no. 3707.

C. DIFFORMIS L. VIRGINIA: in clay of marsh bordering Owl Creek, Virginia Beach, no. 3710.

Cyperus difformis is a species of wide dispersal in the Old World tropics of Asia, Africa, Australia and the Pacific Islands. In America it seems not to have been noted except in Mexico, where it is local, and in California, where it has recently appeared in rice-fields. It abounds in the clay ditches south of the small brackish pond of Owl Creek, growing in company with the typical plants of such a habitat, where it might be indigenous or with equal probability a recent introduction. It may be another of the recent introductions into our

flora from the warm Far East, like *Cyperus Iria*, *C. amuricus* Max.[1] and *Polygonum caespitosum* Blume, var. *longisetum* (De Bruyn) A. N. Steward.[2] It is most probable that these oriental weeds have come in in rice-straw used as packing.

C. HASPAN L. Local: inundated swales back of the dunes, south of False Cape, no. 3733.

C. HALEI Torr. Silts near outlet of Rainey's Pond, Sand Bridge, no. 3719.

First north of Florida; leaf-margins very harsh.

C. LANCASTRIENSIS Porter. Border of woods and in ditches, Little Neck, nos. 3735 and 3736.

C. RETROFRACTUS (L.) Torr. Dry pinelands, Cape Henry, no. 3734, *F. & G.*, no. 2787.

KYLLINGA PUMILA Michx. Frequent in Princess Anne Co.: wet peaty depressions in sandy pineland, The Desert, Cape Henry, no. 3741; damp sand and clay back of the ponds, Dam Neck, no. 3742.

ELEOCHARIS QUADRANGULATA. In 1905 I pointed out[3] that the very distinct species with sharply quadrangular culms, *Eleocharis quadrangulata* (Michx.) R. & S., Syst. ii. 155 (1817), is quite unlike the tropical *E. mutata* (L.) R. & S., with which it had been confused. At that time I was familiar with *E. quadrangulata* chiefly at its northeasternmost station, Lake Waban at Wellesley, Massachusetts. Mr. Long and I saw *E. quadrangulata* several times in Princess Anne County and twice collected it and he, Mr. Griscom and I, in 1935, saw it in abundance and made one collection. Our material and all other from Princess Anne County and all I have seen from South Carolina, North Carolina, Delaware, and Cape May, New Jersey, agrees in being more slender and averaging smaller in all parts than the plant of the northern and inland states; but material from Savannah, Georgia is like the northern and inland plant. In the more slender plant the purple upper sheath at the base of the culm is tubular to within 10 to 5 mm. of the tip and it tardily ruptures. In the coarser plant the free tip is usually 4–6 cm. long, sometimes 8 cm., and the sheath so promptly ruptures that the free tip appears even longer.

Scirpus quadrangulatus Michx. Fl. Bor.-Am. i. 30 (1803), the type of *Eleocharis quadrangulata*, came from South Carolina and a photograph of the type most kindly sent by Professor Humbert of the Muséum National d'Histoire Naturelle at Paris and another sent by

[1] See Fern. & Grisc. RHODORA, xxxvii. 148 (1935).
[2] See Blake, RHODORA, xxxiv. 146, 147 (1932).
[3] RHODORA, xxvii. 38, t. 149, figs. 1–4 (1905).

Rev. Hugh O'Neill of the Catholic University of America show it to be the slender extreme of the southern coastal plain. I am accordingly differentiating two varieties, as follows:

Eleocharis quadrangulata (Michx.) R. & S., var. **typica.** *Scirpus quadrangulatus* Michx. Fl. Bor.-Am. i. 30 (1803). *E. quadrangulata* (Michx.) R. & S. Syst. ii. 155 (1817). Culms 3–9 dm. high, 1.5–4 mm. thick; upper basal sheath with free tip 0.5–1 cm. long; spikelet 1.5–4 cm. long; achenes 2–2.5 mm. long, 1.4–1.8 mm. broad.—Pools of coastal plain, South Carolina to Cape May, New Jersey.

Var. **crassior**, var. nov., culmis 6–12 dm. altis, 3–5.5 mm. crassis; apice libero vaginae 1.5–8 cm. longo; spiculis ad 6 cm. longis; achaeniis 2.2–3 mm. longis 1.6–2 mm. latis.—Georgia to Texas, locally north to Massachusetts, Connecticut, New York, southern Ontario, Michigan, Wisconsin, Missouri and Oklahoma. Type: in 3–8 dm. of water, Waban Lake, Wellesley, Massachusetts, October 3, 1908, *Fernald & Wiegand* in Pl. Exsicc. Gray. no. 133 (in Gray Herb.).

It is most probable that var. *crassior* is *Scirpus marginatus* Muhl., Gram. 28 (1817), which, on account of the earlier *S. marginatus* Thunb., was renamed *S. albomarginatus* R. & S. Mant. ii. 74 (1824). No material of Muhlenberg's plant can be found at Philadelphia; consequently a new type is selected for the coarse variety, for which the name assigned by Roemer & Schultes would be inappropriate.

E. rostellata Torr. Brackish marsh, Lynnhaven, no. 3760.

E. albida Torr. Local: inundated swales back of the dunes, south of False Cape, no. 3767, *F. G. & L.*, no. 4565.

E. Lindheimeri (Clarke) Svenson, Rhodora, xxxi. 199 (1929). Forming dense turf on open wet sand bordering an inundated swale back of the dunes, south of False Cape, Princess Anne Co., no. 3772, also *F. G. & L.*, no. 4572.

The first collection on the coastal plain from east of Texas and Oklahoma. Our material is quite like the type collection (*Lindheimer*, no. 315) but a little stouter. On the wet sand near False Cape (on the Back Bay side) it forms a dense green carpet, like a lawn, promptly distinguished from the taller and ubiquitous *E. flaccida* (Reichenb.) Urban by its spongy culms only up to 8 cm. high, its few-flowered flat spikelets, with narrow herbaceous and strongly striate scales, and its longitudinally ridged and trabeculate achenes.

E. microcarpa Torr. Wet peaty depressions in sandy pineland, The Desert, Cape Henry, no. 3761.

Quite typical, an extension north from South Carolina, though the only slightly different var. *filiculmis* Torr. (*E. Torreyana* Boeckl.), which is stiffer and with chestnut-brown and firmer scales, extends northward locally to eastern Connecticut. The futility of trying to

keep *E. Torreyana* apart as a species is well shown by the treatment in Small's Manual. In the key, on page 160, *E. microcarpa* is given a whole call by itself: "Scape capillary: achene-body 0.5 mm. long," while *E. Torreyana* comes under "Scape filiform: achene-body over 0.5 mm. long," with a further division indicating that the achenes are "nearly 1 mm. long." The distinction between "capillary" and "filiform" is a bit erudite for a key, and in Small's fuller description of *E. microcarpa* (p. 164) the achenes have shown some instability, becoming "0.5 mm. long or a little longer." That is what they do in Nature. After comparing many of them I have given up trying to separate as species *E. Torreyana* from *E. microcarpa*. When Torrey first called attention to the two tendencies, he did not consider them separate species and even doubted whether they were varietally separable and he did not consider that capillary and filiform culms were fundamentally different. *E. microcarpa*, based on material from New Orleans, was fully described, with capillary culms 6–8 inches long; spikelets ("spikes") nearly 2 lines long; scales with "sides brownish-red"; and "*Nut* scarcely one-third of a line [0.7 mm.] long." His β. ? *filiculmis*, from New Jersey, had "*Culms* . . . . capillary or filiform, . . . wiry, 3–4 inches high. *Spikes* more than two lines long. *Scales* dark chestnut-coloured." Torrey noted a slight difference in the shape of the achene (nut) in his specimens but it is one which quickly disappears upon examination of a large series of the two extremes. *E. Torreyana* Boeckeler was merely Torrey's unfortunately named *E. microcarpa*, var. ? *filiculmis* raised without indication of new characters to specific rank.

Eleocharis **ambigens**, sp. nov. (tab. 387, figs. 1–8), laxe stolonifera, rhizomate stolonibusque firmis purpureo-castaneis 1.5–2 mm. crassis; culmis subrigidis pallidis 2.5–6 dm. altis 0.8–1.5 mm. crassis in caespitibus parvis; vaginis artis basi purpurascentibus vel castaneis ad apicem oblique subtruncatis coriaceis; spicula lanceolata vel anguste ovoidea 4–9 mm. longa 2–3.5 mm. crassa, laxe pauciflora; squama inferiora spathiformi late ovata subcoriacea stramineo-grisea basi plerumque valde prolongata; squamis fertilis lanceolato-ovatis acutis vel subacutis pallide brunneis margine albido-hyalinis, imis mediisque 2–3 mm. longis; setis 2–3 brevissimis vel nullis; achaeniis ellipsoideo-obovoideis biconvexis stramineis deinde subcastaneis 1.2–1.7 mm. longis 1 mm. latis minute reticulatis; tuberculo depresso-deltoideo apiculato 0.2–0.5 mm. alto 0.5–0.7 mm. lato.—Pond-margins and marshes, Elizabeth Islands, Massachusetts to southeastern Virginia. Massachusetts: peaty margin of Sheep Pond, Cuttyhunk, August 11, 1927, *Fogg*, no. 2526. Rhode Island: damp sandy shore of Wash Pond, Block Island, August 22, 1913,

Fernald, Hunnewell & Long, no. 8887. New Jersey: toward the beach, Cape May Point, July 17, 1906, *S. S. Van Pelt;* Race Course Pond, Cape May Co., June 12, 1911, *O. H. Brown;* edge of salt marsh, Cape May, July 4, 1929, *Svenson*, no. 3162. Virginia: marshes bordering ponds, Dam Neck, Princess Anne Co., July 30, 1934, *Fernald & Long*, no. 3765 (type in Gray Herb.); same station, June 16, 1935, *Fernald, Griscom & Long*, no. 4567; swale bordering Muddy Creek, Princess Anne Co., June 19, 1935, *Fernald, Griscom & Long*, no. 4569; swales and pond-margin, outlet of Rainey's Pond, June 19, 1935, *Fernald, Griscom & Long*, no. 4570; swales back of the dunes, Sand Bridge, June 19, 1935, *Fernald, Griscom & Long*, no. 4571; boggy swale by Northwest River, near Northwest, June 18, 1935, *Fernald, Griscom & Long*, no. 4568.

Eleocharis ambigens has been distributed sometimes as *E. palustris* (L.) R. & S., sometimes as *E. Smallii* Britton, again as *E. uniglumis* (Link) Schultes. It is the puzzling form which influenced the late Miss Brackett and me to treat as a variety of *E. uniglumis* the plant of saline and brackish shores from the Gulf of St. Lawrence to Virginia, *E. uniglumis* var. *halophila* Fern. & Brackett, Rhodora, xxxi. 72, t. 183 (1929). All three species, *E. palustris, E. Smallii* and *E. uniglumis* (fig. 9–11) have the sheaths herbaceous at the oblique summit and the achenes smooth or only obscurely pebbled; and the first two have 2 or 3 narrow basal scales. The spathiform single basal scale of *E. ambigens* allies it with *E. uniglumis,* but that boreal species (reaching its southern limit in eastern America on the mountains of Newfoundland) has a broader tubercle (fig. 11) 0.6–1 mm. broad, its spikelets are usually twice as large and with purple to castaneous firm scales (fig. 9), and its achene is not definitely reticulated.

With *Eleocharis ambigens* now cleared from the boreal *E. uniglumis,* the troublesome series which was thought to connect the latter with its var. *halophila* disappears and the latter stands out as the clearly marked species which Miss Brackett and I were considering it until the Block Island and Cape May plants came to our attention. Many specimens were labeled and distributed by us as *E. halophila* and that binomial can now be revived:

E. **halophila** (Fernald & Brackett) Fernald & Brackett in herb. *E. uniglumis,* var. *halophila* Fernald & Brackett, Rhodora, xxxi. 72, t. 183 (1929). Figs. 12–14.

Eleocharis ambigens differs from *E. halophila* in the cartilaginous orifice of the sheath, paler, thinner and shorter scales (the reddish to castaneous firm and lustrous scales of *E. halophila* 3–5 mm. long).

more broadly obovoid or pyriform reticulate achene with lower and broader tubercle, the slender-conical to lanceolate tubercle of *E. halophila* being only 0.2–0.5 mm. broad at the bulbiform base. For comparison a sheath-orifice (fig. 13), a spikelet (fig. 12) and an achene (fig. 14) from the type of *E. halophila* are shown in plate 387. The range of E. halophila was extended southward from Delaware by its discovery in Virginia: wet sandy depressions, False Cape, June 20, 1935, *Fernald, Griscom & Long*, no. 4566.

E. simplex (Ell.) A. Dietr. Apparently now local: swampy and inundated woods, north of Blackwater River, no. 3764.

E. tuberculosa (Michx.) R. & S. Common in damp peaty swales and depressions throughout the area; the following collected: south of Grassfield, no. 3762; Rifle Range, south of Rudy Inlet, no. 3763.

Dichromena colorata (L.) Hitchc. Local: inundated swales back of the dunes, south of False Cape, no. 3740, also *F. G. & L.*, no. 4573.

Fimbristylis puberula (Michx.) Vahl, forma **pycnostachya**, f. nov. (tab. 388, fig. 3), spiculis valde confertis dense glomerulatis. Type: damp sandy flats back of the dunes, Rifle Range, south of Rudy Inlet, Princess Anne Co., Virginia, July 30, 1934, *Fernald & Long*, no. 3752 (in Gray Herb.). Also collected in inundated swales back of the dunes, south of False Cape, Princess Anne Co., no. 3753; and examined from Missouri and Oklahoma.

F. puberula, forma **eucycla**, f. nov. (tab. 388, fig. 2), spiculis pedicellatis, obovoideis vel obovoideo-ellipsoideis apice valde rotundatis vel subtruncato-rotundatis. Type: swales back of the dunes, Rifle Range, south of Rudy Inlet, Princess Anne Co., Virginia, July 31, 1934, *Fernald & Long*, no. 3750 (in Gray Herb.). Also from the same locality, nos. 3747, 3748; and examined from Georgia (Tybee Island, *Harper*, no. 738; Cumberland Island, *Harper* no. 1544).

Typical *Fimbristylis puberula* (plate 388, figs. 1 and 4), as I understand it, has the spikelets narrowed at summit, either obtuse or subacute. It is of wide range, northward near the coast to Long Island and inland in the Mississippi drainage to Indiana, Illinois, Nebraska and Colorado. Some of the material of the interior has been separated as *F. interior* Britton, Ill. Fl. ed. 2, i. 320, fig. 785 (1913), because it has "Scales glabrous," whereas *F. puberula* was defined by Dr. Britton as having "Scales, at least the lower, pubescent or puberulent." *F. interior* was given a range from "Colorado and Nebraska to Texas." There are before me several sheets from Colorado, Nebraska and Kansas (as well as many from Oklahoma). The 3 sheets from Colorado all show, with a lens × 8, puberulent lower scales; the 2 from Kansas likewise show them, and 1 from

Photo. E. C. Ogden.

FIMBRISTYLIS PUBERULA: FIG. 4, umbel, × 1.
F. PUBERULA, forma EUCYCLA: FIGS. 1 and 2, plant, × 1.
F. PUBERULA, forma PYCNOSTACHYA: FIG. 3, umbel (glomerule), × 1.

Photo. E. C. Ogden.

FIMBRISTYLIS BALDWINIANA: inflorescences, × 1; spikelets, × 5; achenes, × 10.

Nebraska has them puberulent, another apparently not. Conversely, along the Atlantic coast the puberulence is often most evasive and seen only on the very youngest spikelets, if at all; consequently, in sending out the collections of L. F. and Fannie R. Randolph from North Carolina, the specimens which were young enough to show some puberulence were called *F. puberula* (*Randolph & Randolph*, no. 1024), those which were older were called *F. interior* (*R. & R.* no. 540).

Fimbristylis puberula, when lacking the puberulence, can best be told from *F. castanea* (Michx.) Vahl (the *F. spadicea* of continental American authors), by growing in small soft tufts, with thin and soft leaf-sheaths and (when properly collected) showing slender rhizomes and stolons, which in hard soil are not often collected. *F. castanea* forms dense tussocks, has dark coriaceous sheaths and is nonstoloniferous.

F. CASTANEA (Michx.) Vahl. Forming dense tussocks at borders of salt or brackish marshes: Wachapreague, Accomac Co., no. 3743; Lynnhaven, no. 3744.

FIMBRISTYLIS BALDWINIANA (Schultes) Torr. (PLATE 389). The plant of southeastern Virginia is quite typical, but in studying it I have taken the opportunity to compare it with the recently proposed *F. Darlingtoniana* Pennell, Bartonia, xv. 30 (1933). The two, as maintained by Pennell, differ as follows:

Achene pale yellow, finely and sharply striate-sulcate, about 1 mm. long; scales pale brown, green-ridged, dull or slightly shining, as wide as long, acute or slightly mucronulate, slightly bowed, wholly appressed; spikelets several, on the widely spreading rays of the simple or once-compound umbel; stem usually 2–3.5 dm. tall........................1. *F. baldwiniana*

Achene silvery white, striate or slightly sulcate, slightly more turgid, about 1.25 mm. long; scales dark brown, green-ridged, lustrous, strongly bowed and with tips loosely ascending; spikelets 1 to 6, on the ascending rays of the nearly always simple umbel; stem usually 0.5–2.0 dm. tall......2. *F. darlingtoniana*

Fimbristylis Baldwiniana is maintained, rightly, for the plant of the Atlantic coastal plain, from Maryland to Florida and Texas. *F. Darlingtoniana* is supposed to be confined to "Serpentine Barrens of southeastern Pennsylvania, northeastern Delaware, and doubtless in adjacent Maryland." As illustrated by Pennell (his fig. 1) the achenes are quite different. In studying the material in the Gray Herbarium, including 11 sheets of *F. Darlingtoniana* from the serpentines of southeastern Pennsylvania and adjacent Delaware (two of them fine sheets from William Darlington himself) I find myself puzzled to keep this plant apart as a species. As a geographic variety it is

hardly separable, too many plants of the southern sands and granitic gravels having castaneous scales (FIGS. 18, 19, 22, 23), several of them having quite as large (FIGS. 24, 25) and as pale achenes; and in southeastern material, although the usually smaller and grayer achenes are commonly rougher, it is not unusual to find them embarrassingly smoothish (FIGS. 8, 24, 31), while quite roughened achenes are frequent in the material of *F. Darlingtoniana* (FIGS. 12, 17, 30).

As to the "several spikelets" on "widely spreading rays" of the umbel in *F. Baldwiniana*, as opposed to the only 1–6 spikelets "on the ascending rays" in *F. Darlingtoniana*, it is easy to find plants of the South with only 1–6 spikelets (Hyattsville, Maryland, September 30, 1912, *Holm;* Bedford Co., Virginia, September 4, 1871, *A. H. Curtiss;* North Landing, Norfolk Co., Virginia, *Fernald & Griscom*, no. 2772; Rosemont, Princess Anne Co., Virginia, *Fernald & Long*, no. 3756 (FIG. 13); Burke Co., North Carolina, *M. A. Curtis;* Leslie, Georgia, *Harper*, no. 405; Athens, Georgia, *Harper*, no. 68 (FIG. 22); Rock Hill, Florida, *Harper*, no. 92; etc.). Conversely, one of the Darlington sheets from West Chester, Pennsylvania has as many as 10 spikelets, while *Pennell's* from Williamson School (FIG. 9) has 9 and the rays are as widely divergent as in much southern material. In order to check the characters reputed to separate two species I have asked Mr. Ogden to reproduce the inflorescences and the details of several specimens. These are shown in PLATE 389. I am unable to sort these photographs into two piles representing different species.

FIMBRISTYLIS AUTUMNALIS (L.) R. & S., var. **mucronulata** (Michx.), comb. nov. *Scirpus mucronulatus* Michx. Fl. Bor.-Am. i. 31 (1803). *F. mucronulata* (Michx.) Blake, RHODORA, xx. 25 (1918).

Blake showed in 1918 that the type of *Scirpus autumnalis* L., upon which *Fimbristylis autumnalis* rests, is the plant with lance-ovoid spikelets in comparatively little-branched inflorescences, which was described in 1855 as *F. Frankii* Steud. Syn. Pl. Cyp. 111 (1855) and for which the name *F. geminata* Kunth (1837) is in current use; while the extreme with more slender spikelets in often more compound inflorescences is *F. mucronulata* (Michx.) Blake, based on *Scirpus mucronulatus* Michaux, which came from the Carolinas. In their extremes the two are easily distinguished, but so many transitions occur (in shape and size of spikelet, color of scales, size and roughening of achenes and degree of branching) that I am at a loss to see anything but two strong divergencies of one specific type. Those to whom tendencies are equivalent to species will maintain them as specifically

distinct. The identifications, as they come to the Gray Herbarium, indicate that no one has yet succeeded in stating differences between them which others can clearly interpret.

Scirpus Olneyi Gray. Abundant in saline or brackish marshes and even in fresh river-marshes, Princess Anne Co.: Lynnhaven, no. 3777; Blackwater River (fresh), *F. G. & L.*, no. 4574.

Rynchospora corniculata (Lam.) Gray. Local: in clay at border of swamp, Rosemont, no. 3784.

R. gracilenta Gray. Local in Norfolk Co.: wet, peaty clearings in woods of *Pinus serotina*, south of Grassfield, no. 3792.

Rynchospora gracilenta Gray, var. **diversifolia**, var. nov. (tab. 390, figs. 4–7), quam forma typica crassiore firmioreque ad 1 m. alto; foliis caulinis planis 1.5–2.5 mm. latis; cymis corymbiformibus terminalibus 1–1.5 cm. latis; spiculis 4–5.5 mm. longis; achaeniis 1.6–2 mm. longis, tuberculo 1.5–2.5 mm. longo.—Peats and wet sands of the Coastal Plain from Louisiana to Florida, north very locally to southern New Jersey. Type: swales back of the dunes, Rifle Range, south of Rudy Inlet, Virginia, July 31, 1934, *Fernald & Long*, no. 3796, in Gray Herb.

Typical *Rynchospora gracilenta*, very characteristic in its type-locality, the Pine Barrens of New Jersey, has the leaves all capillary or the cauline at most linear-involute and up to 1 mm. broad, the terminal cymes only 3–10 mm. broad, the spikelets 3–4 mm. long, achenes 1.2–1.5 mm. long and tubercle 0.8–1.4 mm. long. Its details are shown in figs. 1–3. Var. *diversifolia* has the leaves of the basal tufts capillary as in the typical form of the plant, but is quickly distinguished from it by its stiffer habit, broadish cauline leaves, and longer spikelets, fruits and tubercles. Several collections from Louisiana, Florida and Georgia belong to it and at least one from New Jersey: Quaker Bridge, August 18, 1866, *Diffenbaugh.*

Typical slender-leaved *Rynchospora gracilenta* was collected in wet, peaty clearings in woods of *Pinus serotina*, south of Grassfield, Norfolk Co., no. 3792.

Rynchospora glomerata (L.) Vahl. In 1918 Dr. S. F. Blake showed[1] that typical *R. glomerata* is the coarse southern plant which had been called *R. glomerata*, var. *paniculata* (Gray) Chapm., while the somewhat smaller plant, which extends northward to Nova Scotia, New Brunswick, New England, northern New York, southern Ontario and Wisconsin, he identified with *R. capitellata* (Michx.) Vahl. Dr. Blake clearly established, through typical specimens sent to European herbaria, the identity of the coarse southern plant; the

[1] Blake, Rhodora, xx. 25–28 (1918).

identity of the smaller northward-ranging plant was less finally settled. At that time Blake was quite satisfied that the two were distinct species, saying: "The more northern plant, which has passed as true *glomerata*, has an achene 1.5 mm. long (including the crustaceous 'perianth'-base, but excluding the style) and 0.8 mm. wide, while in the more southern var. *paniculata* the achene is 2 by 1.5 mm. and much more umbonate. In the southern plant, moreover, the spikelet is usually 1-fruited, in the northern plant 2–3-fruited, as long ago noted by Kunth (Enum. ii. 296 (1837)) in describing the southern form as *R. glomerata* var. *robustior*. This difference in size and shape of achenes, which runs with great constancy through a series of more than 115 collections of the two plants, in combination with other differences in size of plant, breadth of leaf, looseness of inflorescence, and number of achenes in the spikelet fully confirms the specific distinctness of the two plants."

Nevertheless, although the more northern plant can hardly be confused with the largest extreme of the more southern, two trips to southeastern Virginia where both grow, first in September, 1933 with Mr. Ludlow Griscom, then with Mr. Bayard Long in late July and early August, 1934, have led me to a close study of the group with the hope of finding the clear differentiations emphasized by Blake but not satisfactorily evident in the field. As a result of this study I am forced to the decision that Asa Gray's later treatment of *R. glomerata* as a variable species, including both the northern and the southern extremes, was better justified than his earlier and less experienced judgment, that the latter were distinct species.

From inflorescences of the largest and most branching of true *Rynchospora glomerata* I get achenes with variation in size much greater than found by Blake: a range of 1.7–2 mm. in length and of 0.8–1.5 mm. in breadth. In fact, I take the extreme breadth, 1.5 mm., from Blake's statement; I have measured none exceeding 1.4 mm. The tubercle in this large southern extreme varies from 1–1.8 mm. long. As to the 1-flowered spikelets, ordinarily they are so; but it is not difficult to find them with 2 flowers, for instance in an Arkansas specimen (Grand Prairie, *Harvey*, no. 13) which Blake has specially annotated as *R. glomerata*. It, like several other sheets of the latter, exhibits 2-flowered as well as 1-flowered spikelets.

In the northern plant, *Rynchospora capitellata* of Blake's treatment, I have taken achenes from the most northeastern material, from Nova Scotia, New Brunswick and New England. I find it difficult

Photo. E. C. Ogden.

Rynchospora gracilenta: fig. 1, plant, × ⅖; fig. 2, inflorescence, × 2; fig. 3, achene, × 10.

R. gracilenta, var. diversifolia: fig. 4, plant, × ⅖ (type); fig. 5, inflorescence, × 2; figs. 6 and 7, achenes, × 10.

Photo. E. C. Ogden.

Rynchospora axillaris: fig. 1, type, × ¾, from photograph supplied by Professor H. Humbert.
R. cephalantha: fig. 2, inflorescence, × 1; fig. 3, achene, × 10.
R. microcephala: fig. 4, inflorescence, × 1; fig. 5, achene, × 10.

to get any to meet the stated specifications: 1.5 mm. long, 0.8 mm. wide. Instead, I find a variation of 1.5–1.8 mm. in length, of 0.8–1.2 mm. in breadth; while the tubercle ranges from 0.8–1.2 mm. long.

These measurements, it will be noted, all overlap. As a result I find it impossible, without further illumination, to retain *Rynchospora capitellata* as a good species. Its first available varietal name is *R. glomerata*, var. *minor* Britton, Trans. N. Y. Acad. Sci. xi. 87 (1892). At the same time (p. 88) Britton published *R. glomerata*, var. *leptocarpa* Chapm. for a plant of the southern Coastal Plain. The slight difference in the shape of the achene, the remote and few axillary cymes and the narrow leaves of the latter all appear sporadically in the North, but for the main series of the latter area the name var. *minor* is without question. Var. *leptocarpa*, although it seems to me unworthy special recognition, is maintained by Blake; and Small elevates it to specific rank, as *R. leptocarpa* (Chapm.) Small, Man. 181, 1503 (1933).

Throughout the genus the direction of the barbs or serratures on the bristles is very fickle, as it is in *Eleocharis* and *Scirpus*. From the same areas one can get retrorsely or upwardly barbed bristles or even those which are perfectly smooth. Such divergencies from the ordinary are most interesting but they do not constitute true varieties (as I use the term). As forms they are adequately and more satisfactorily covered. My own interpretation of *Rynchospora glomerata* is covered by the following key.

a. Culms stoutish, 0.5–2 m. high; leaves 3–7 mm. broad; inflorescence 0.3–1 m. long, its axillary peduncles freely forked; spikelets 5–6 mm. long, most often 1 (sometimes 2)-flowered; achenes 1.7–2 mm. long, 0.8–1.5 mm. broad; tubercle 1–1.8 mm. long . . . . . Var. *typica*.

a. Culms rather slender, 0.1–1.5 m. high; leaves 0.5–4 mm. broad; inflorescence 0.2–6 dm. long, its axillary peduncles less forked or simple; spikelets 3–5 mm. long, usually 2–3-flowered; achenes 1.5–1.8 mm. long, 0.8–1.2 mm. broad; tubercle 0.8–1.2 mm. long . . . . *b*.

b. Bristles serrulate or barbed.

Bristles retrorsely barbed . . . . . Var. *minor*.

Bristles upwardly barbed . . . . . Var. *minor*, forma *controversa*.

b. Bristles smooth . . . . . Var. *minor*, forma *discutiens*.

R. GLOMERATA (L.) Vahl, var. **typica**. *Schoenus glomeratus* L. Sp. Pl. i. 44 (1753). *R. glomerata* (L.) Vahl, Enum. ii. 234 (1805); Blake, RHODORA, xx. 26, fig. 1 (1918). *R. paniculata* Gray, Ann. Lyc. N. Y. iii. 211, t. vi. fig. 21 (1835), not Presl (1828). *R. glomerata*, var. *robustior* Kunth, Enum. ii. 296 (1837). *R. glomerata*, var. *paniculata* (Gray) Chapm. Fl. So. States, 528 (1860); Britton, Trans. N. Y. Acad. Sci. xi. 88—repr. 15 (1892).—Florida to Texas, north to Delaware, Maryland, Tennessee, Arkansas and Oklahoma.

Var. minor Britt. Trans. N. Y. Acad. Sci. xi. 88—repr. 15 (1892). *Schoenus capitellatus* Michx. Fl. Bor.-Am. i. 36 (1803), in part. *R. capitellata* (Michx.) Vahl, Enum. ii. 235 (1805); Blake, Rhodora, xx. 27 (1918). *R. glomerata* Gray, Ann. Lyc. N. Y. iii. 217, t. vi. fig. 29 (1835) and later authors up to 1918. *R. glomerata*, var. *leptocarpa* Chapm. in Britt. l. c. (1892), the slenderest state, of swampy woods and thickets. *R. capitellata*, var. *minor* (Britt.) Blake, Rhodora, xx. 28, fig. 2 (1918). *R. capitellata*, var. *leptocarpa* (Chapm.) Blake, l. c. fig. 5 (1918). *R. leptocarpa* (Chapm.) Small, Man. 181, 1503 (1933).—Florida to Texas, north to Nova Scotia, New Brunswick, northern New England, northern New York, southern Ontario and Wisconsin.

Var. minor, forma **controversa** (Blake), comb. nov. *R. capitellata*, var. *controversa* Blake, Rhodora, xx. 28, fig. 3 (1918). *R. Smallii* Britt. in Small, Fl. Se. U. S. 1321, 1327 (1903).—Scattered in the range of var. *minor*, New Jersey and eastern Pennsylvania to North Carolina.

It is significant of the overemphasis which has been placed on the fickle characters of the bristles (as to their barbing) that Britton should have treated *R. glomerata*, var. *discutiens* and *R. capillacea*, var. *leviseta* (both with smooth instead of retrorsely barbed bristles) as mere varieties or as unworthy recognition (Ill. Fl. ed. 2) and *R. cephalantha* Gray (*R. axillaris* Britt. as to plant, not *Schoenus axillaris* Lam.) with upwardly (instead of retrorsely) barbed bristles as apparently nonexistent, while *R. glomerata*, var. *minor* with the bristles upwardly barbed was treated as a distinct species.

In fact, *R. cephalantha* (pl. 391, figs. 2 and 3) has the bristles either upwardly or downwardly serrulate in the same colony. When he described this species Gray, Ann. Lyc. N. Y. iii. 219 (1835), said of it: "A most remarkable circumstance with regard to this species, and so far as my observation extends, peculiar to it, is the diversity in the direction of the hispidness of the bristles: even in different individuals from the same cluster some of the bristles are hispid upward and others downward."

As to var. *leptocarpa*, as already stated, I can find no character of sufficient definiteness to keep it apart. Plants of the southern Coastal Plain, wandering into swampy woods and thickets (instead of growing in the open habitats) become attenuated in all parts and paler and seem to be what Chapman originally had. To me they are merely "drawn" and narrow-leaved responses to unfavorable conditions.

Var. minor, forma **discutiens** (Clarke), comb. nov. *R. glomerata*, var. *discutiens* Clarke in Britt. Trans. N. Y. Acad. Sci. xi. 88 (1892). *R. capitellata*, var. *discutiens* (Clarke) Blake, Rhodora, xx. 28, fig. 4

(1918).—Occasional, often abundant, in the range of typical var *minor*, Nova Scotia to Wisconsin and North Carolina.

An explanation is necessary regarding *Rynchospora axillaris* (Lam.) Britt. Lamarck gave the briefest of diagnoses:

> 643. SCHOENUS *axillaris*.
> S. culmo triquetro folioso, corymbis minimis alternis axillaribus, spiculis confertis.
> E. Carolina. *D. Fraser.*

Kunth, whose *Rynchospora glomerata* included the smaller var. *minor*, i. e. *R. capitellata*, and who called the largest southern extreme (which Blake has shown to be true *R. glomerata*) *R. glomerata*, β. *robustior*, had no hesitation in placing *Schoenus axillaris* in the synonymy of his *R. glomerata:* "Schoenus axillaris *Lam. Ill.* 1. 137. (*fide herb. Willd.*)"— Kunth Enum. ii. 296 (1837); and he recognized *R. cephalantha* Gray, Ann. Lyc. N. Y. iii. 218 (1836), without doubt, as a distinct species (Kunth. l. c. 540). But Boeckeler, who had a very confused conception of American *Cyperaceae*, completely tangled matters. I do not venture to untangle his snarls, further than to point out that he took up *R. cephalantha* as a species and in its synonymy placed three wholly different species which no one knowing *Rynchospora* would merge with the almost unique *R. cephalantha* (PL. 391, FIGS. 2 and 3). Boeckeler's synonymy of his *R. cephalantha* was: "*R. glomerata* Kunth, 296 partim.—*R. distans* Willd. herb. no. 1141, f. 1.—*Schoenus axillaris* Lam. (fide specim. in Herb. Willd.)—*Schoenus capitellatus* Michx. l. c. 36 (v.s.)." That is certainly a catholic view of a species: as to *R. glomerata* see above; *R. distans* (Michx.) Vahl is a very different species of the southern coastal plain and the West Indies, with nearly filiform leaves and tiny inflorescences; *Schoenus capitellatus* is, as already sufficiently emphasized, the wide-ranging plant, extending northward into Canada, which has long passed (erroneously) as typical *R. glomerata;* and Kunth had explicitly stated that *S. axillaris* was the same as *S. capitellatus*. Nevertheless, notwithstanding Boeckeler's complete misunderstanding of *R. cephalantha*, the latter species was submerged by Britton wholly on the basis of Boeckeler's misinterpretation:

> "RHYNCHOSPORA AXILLARIS (Lam.) (*Schoenus axillaris*, Lam., Encyc. i., 137 (1791); *R. cephalantha*, Gray, Ann. Lyc. N. Y. iii., 218 (1836). In taking up the name I am guided by Boeckeler in Linnaea, xxxvii., p. 572, who states that he saw a specimen named by Lamarck in Willdenow's Herbarium."—Britton, Bull. Torr. Bot. Cl. xv. 104 (1888).

Since all other species referred by Boeckeler to his *Rynchospora*

cephalantha are surely not conspecific with it, it has seemed important to learn exactly what Lamarck had before him when he described *Schoenus axillaris*. This, happily, has been possible through the great kindness of Professor Humbert of the Muséum National d'Histoire Naturelle in Paris, who has supplied me with a photograph of Lamarck's type (our PL. 391, FIG. 1). The specimen is hopelessly young, a mere fragment from a very young inflorescence, but that it is not *R. cephalantha* (FIGS. 2 and 3) is perfectly apparent.

Personally I cannot match it with any degree of certainty. Its prolonged bracts, much longer than in any *mature* material known to me, and its wholly immature spikelets are so nearly impossible to match, that, in a genus with specific characters chiefly in the mature achenes it would be very unwise to attempt to displace a well defined specific name by the essentially unrecognizable *R. axillaris* (Lam.) Britton, as to type.

It thus seems clear that, in spite of the unfortunate synonymy given by Boeckeler and the faith in his judgment shown by Britton, *Rynchospora cephalantha* stands out as a species free from earlier nomenclatural entanglements. One later such alliance, however, needs dissolving. This is *R. axillaris*, var. *microcephala* Britton, Trans. N. Y. Acad. Sci. xi. 89—repr. 16 (1892) or *R. microcephala* Britton in Small, Fl. Se. U. S. 195 and 1327 (1903). This was originally defined merely as having "Heads smaller; spikelets only about 1 mm. wide" and was maintained as a small-headed extreme of *R. axillaris* in Britton & Brown, ed. 1, and by Robinson & Fernald; Small took it up in 1903 as a species, ascribing it to Britton, but in 1913 (Ill. Fl. ed. 2) Britton repudiated it, placing it, as *R. axillaris microcephala* in the synonymy of his *R. axillaris* and not mentioning *R. microcephala*. Britton's later view was apparently covered by the comment under *R. axillaris:* "Southern races have much smaller heads and smaller achenes than northern ones."

In geographic range I find little difference. Typical *Rynchospora cephalantha* (*R.* "*axillaris*" of Britton's treatment) extends from Mississippi to Florida, thence to Long Island; *R. microcephala* is also in Mississippi and Florida, but its northern range stops in New Jersey. But the two seem as distinct as any two paired species of *Rynchospora*. I make out the following diagnostic points which seem to indicate that they are not merely large and small variations of a single species but are quite separate entities.

R. CEPHALANTHA. Inflorescence occupying less than 1/3 the height of

the plant, glomerules strictly terminal or in 1–3(–4) of the upper axils; spikelets 5–7 mm. long; achenes 2.2–2.6 mm. long, 1.4–1.6 mm. broad. Figs. 2 and 3.

R. microcephala. Inflorescence occupying 1/3–2/3 the height of the plant, glomerules in 2–6 of the upper axils; spikelets 3–4 mm. long; achenes 1.5–2 mm. long, 0.8–1.2 mm. broad. Figs. 4 and 5.

So far as I have been able to determine, the measurements of spikelets and achenes do not merge. An inflorescence of *R. cephalantha* × 1, is shown in fig. 2, of *R. microcephala,* × 1, in fig. 4; an achene of *R. cephalanatha,* × 10, in fig. 3, of *R. microcephala,* × 10, in fig. 4. The illustrations of *R. microcephala* are from *Fernald & Long,* no. 3785, from pine barrens south of Grassfield, Norfolk Co., Virginia.

R. fascicularis (Michx.) Vahl. Local: wet peaty depressions in sandy pineland, The Desert, Cape Henry, nos. 3789, 3790.

Apparently the first record from north of North Carolina.

R. Wrightiana Boeckl. Local: damp sandy and peaty depressions back of the dunes, Rifle Range, south of Rudy Inlet, no. 3797, also *F. G. & L.,* no. 4577, there associated with *R. rariflora.*

The first record of *R. Wrightiana* from north of North Carolina.

R. rariflora (Michx.) Ell. With the last, abundant and forming dense tussocks, no. 3791, also *F. G. & L.,* no. 4576.

R. cymosa Ell., var. globularis Chapm. Local: same locality as the two preceding, no. 3794, also *F. G. & L.,* no. 4575; typical R. cymosa in clay ditches bordering pine woods, Virginia Beach, no. 3795.

R. caduca Ell. Margin of thicket bordering inundated swale back of the dunes, south of False Cape, no. 3800; boggy swale by Northwest River, Northwest, *F. G. & L.,* no. 4578.

Slight extension northward, from North Carolina.

R. inexpansa (Michx.) Vahl. One of the common species of wet thickets and peats: Pungo Causeway, *F. & G.,* no. 2775; Blackwater River, no. 3799; Dam Neck, no. 3798.

Spikelets often altered into finely echinate spherical galls.

Cladium jamaicensis Crantz. Local: border of inundated woods north of Blackwater River, no. 3801.

Although already known from southeastern Virginia, the giant Saw Grass is not common there. The only place we saw it was slightly north of the Blackwater in the flooded woods bordering North Landing River, where it makes a characteristic growth.

Scleria setacea Poir. Damp sandy and peaty depressions back of the dunes, Rifle Range, south of Rudy Inlet, no. 3803.

Carex Muhlenbergii Schkuhr. Apparently frequent in woods:

Cape Henry, nos. 3816, 3818, also *F. & G.*, no. 2781; Little Neck, no. 3817.

Taller, less cespitose and with more prolonged rhizome than much of the New England plant.

C. ABSCONDITA Mackenz. Very common in woods, either wet or dry: Blackwater River, no. 3808; Little Creek, *F. & G.*, no. 4333; Little Neck, *F. G. & L.*, nos. 4593, 4594; Great Neck, *F. & G.*, nos. 4334, 4335.

Our plant is typical *C. abscondita* (*C. ptychocarpa* Steud., not Link). Mackenzie treats the largest extreme from Florida as a distinct species, his *C. magnifolia*, and separates it from *C. abscondita* by its having leaves "1.5–3.5 dm. long; perigynium 4–4.5 mm. long, the sides 2 mm. wide, the beak 1 mm. long,"[1] whereas *C.. abscondita* is characterized by shorter leaves, "perigynium 2.5–3.5 mm. long, the sides 1.5 mm. wide, essentially beakless." As a large extreme *C. magnifolia* is pronounced, but those who wish some morphological character for a species will treat it as a variety of *C. abscondita*. Chapman, who first described it, called it a variety (of *C. digitalis*) and Bailey treated it as a variety of *C. ptychocarpa*. Plenty of specimens from the northeastern limits of *C. abscondita* have leaves 3.5 dm. long (Purgatory Swamp, Norfolk Co., Mass., many collections) and at its northwestern limit (in Indiana) it often has perigynia 4 mm. long, while material from Hampton, Virginia, with perigynia up to 4 mm. long, has some of them scarcely, others very definitely beaked. As a variety the extreme plant of Florida is worthy recognition; as a species surely not. It is

C. ABSCONDITA Mackenz., var. **glauca** (Chapm.), n. comb. *C. digitalis*, var. *glauca* Chapm. Fl. So. U. S. 541 (1860). *C. ptychocarpa*, var. *macrophylla* Bailey, Mem. Torr. Bot. Cl. i. 48 (1889). *C. magnifolia* Mackenzie in Small, Fl. Se. U. S. ed. 2: 1375 (1913).

C. VENUSTA Dew., var. MINOR Boeckl. (*C. oblita* Steud.). Local: wet peaty clearings in woods of *Pinus serotina*, south of Grassfield, no. 3806.

C. WALTERIANA Bailey, var. BREVIS Bailey. Swampy or inundated woods: Blackwater River, no. 3807; Cape Henry, *F. & G.*, no. 4345.

C. LUPULINA Muhl. Alluvial woods and thickets, and ditches, frequent: Rosemont, no. 3811; Virginia Beach, *F. G. & L.*, no. 4596.

LEMNA PERPUSILLA Torr. Fresh to brackish waters, Princess Anne Co.: Owl Creek, Virginia Beach, no. 3823.

L. VALDIVIANA Phil. Fresh to brackish waters, Princess Anne Co.: Dam Neck, no. 3824, also *F. & G.*, no. 4353.

SPIRODELA POLYRRHIZA (L.) Schleid. Fresh to brackish waters,

[1] Mackenzie in Small, Man. 198 (1933).

Princess Anne Co.: False Cape, no. 3825, also *F. G. & L.*, no. 4598; Lake Joyce, *F. G. & L.*, no. 4599.

COMMELINA COMMUNIS L. Ditches and wet roadsides, common: Macon's Corner, Princess Anne Co., *F. & G.*, no. 2803.

C. HIRTELLA Vahl. Swampy woods and thickets back of the dunes, along Back Bay, False Cape, no. 3832.

HETERANTHERA RENIFORMIS R. & P. Swampy and inundated woods, north of Blackwater River, no. 3833.

JUNCUS EFFUSUS L., var. SOLUTUS Fern. & Wieg. Wet woods and thickets, common: Virginia Beach, no. 3847.

J. EFFUSUS, var. COSTULATUS Fern. Equally common: south of Grassfield, no. 3846.

J. DEBILIS Gray. Wet, peaty clearing in woods of *Pinus serotina*, south of Grassfield, no. 3838.

J. MEGACEPHALUS M. A. Curtis. Inundated swales back of the dunes, south of False Cape, no. 3841.

This station is very near if not exactly that of *R. M. Harper:* "damp hollow between beach and dunes, on coast of Princess Anne Co., about 2 miles n. of state line," July 23, 1918. Besides in the characters usually noted, *Juncus megacephalus* differs from *J. scirpoides* in the larger and more delicate bractlets of the flowers, in the more slender and pointed seeds and in the apparent lack of the whitish finger-like stolons which are so characteristic of the latter. Small (Man.) notes that it is calcicolous. Our material was from slightly brackish sand; and sheets in the Gray Herbarium, which indicate such details of habitat, give the following data: among lime-sinks, Lee Co., Georgia, *Harper,* no. 925; in brackish swamps, Florida, *Chapman;* wet sandy shore of Gulf, Apalachicola, with *Scirpus pungens Spartina patens, Spiranthes graminea, Samolus ebracteatus, Chapman* in Engelm. Herb. Junc. Bor.-Am. Norm., no. 68. Many labels indicate inconclusively ditches, dune-hollows, pine-barrens, prairies, etc.

J. ELLIOTTII Chapm. Damp sandy flats back of the dunes, Rifle Range, south of Rudy Inlet, no. 3837, also *F. G. & L.*, no. 4605.

Although apparently not recorded from north of North Carolina, *Juncus Elliottii* was collected in Elizabeth City County, VIRGINIA, in 1912: roadside ditches, Buckroe and border of marsh between Buckroe and Hampton, *B. L. Robinson*, nos. 316, 317. It has also been collected in one of the famous spots of DELAWARE: border of wet ditch, south of Ellendale, Sussex Co., June 23, 1909, *Bayard Long.* When carefully collected, *J. Elliottii* displays beautiful fusiform tuberous enlargements of many of the elongate roots.

UVULARIA PUBERULA Michx., var. **nitida** (Britton), comb nov. *Oakesia sessilifolia*, var. (?) *nitida* Britton, Trans. N. Y. Acad. Sci.

ix. 13 (1889). *U. sessilifolia nitida* (Britton) Morong, Mem. Torr. Bot. Cl. v. 111 (1894). *U. nitida* (Britton) Mackenz. Torreya, viii. 14 (1908). Plate 392, figs. 2, 3 and 6.

When Mackenzie separated *Uvularia nitida* as a species he correctly emphasized "the close relationship existing between the mountain bellwort (*U. puberula*) and our pine-barren plant" and he gave the distinctions which he found in tabular form, as follows:

	U. nitida	*U. puberula*
Capsule	Sessile, 17 mm. long	Sessile, 24 mm. long
Style	Slender, much exceeding the anthers	Thick, little exceeding the anthers
Leaves	Subcordate, very green on both sides, thinnish, not strongly reticulate-veined; margins minutely serrulate	Subcordate, very green on both sides, thick, strongly reticulate-veined; margins serrulate
Stem angles	Essentially smooth	Serrulate and puberulent

In further discussion Mackenzie said "From the above it may be noted that the differences between *U. nitida* and *U. sessilifolia* are very pronounced, while those between *U. nitida* and *U. puberula* are much more slight. This last-named species is variable, and incomplete specimens from the South, in the Columbia University herbarium, show a close approach to *U. nitida*. The species, however, as a rule, seem decidedly distinct, when represented by good specimens. The style character is apparently especially constant, although it may depend to some extent on the age of the flowers."

I have not had the advantage of knowing the plants in the field but specimens in the Gray Herbarium at once indicate that the capsules of *Uvularia puberula* are not merely "24 mm. long." On fruiting plants from the mountains of Virginia, West Virginia, North Carolina, South Carolina and Tennessee they range from 1.5 to 3.3 cm. long. One number, *Steele & Steele*, no. 286, in the Gray Herbarium, collected September 12th and consequently mature, consists of two fruiting plants, one with a capsule orthodox (2.4 cm. long), the other with it 1.6 cm. long (fig. 1), smaller than Mackenzie allowed for his *U. nitida*. As to the comparative length of style and anthers I find this situation. Material of *U. nitida* from South Lakewood, Ocean Co., New Jersey (*Mackenzie*, no. 4556) has the long style (fig. 2) as prescribed; but another New Jersey sheet, Tom's River, May 30, 1907, *Eggleston*, has the anthers much overtopping the common style (below its forking), as shown in fig. 3.

Turning to the Alleghenies of West Virginia, I find a sheet of perfectly good *Uvularia puberula*, from White Sulphur Springs, May 14

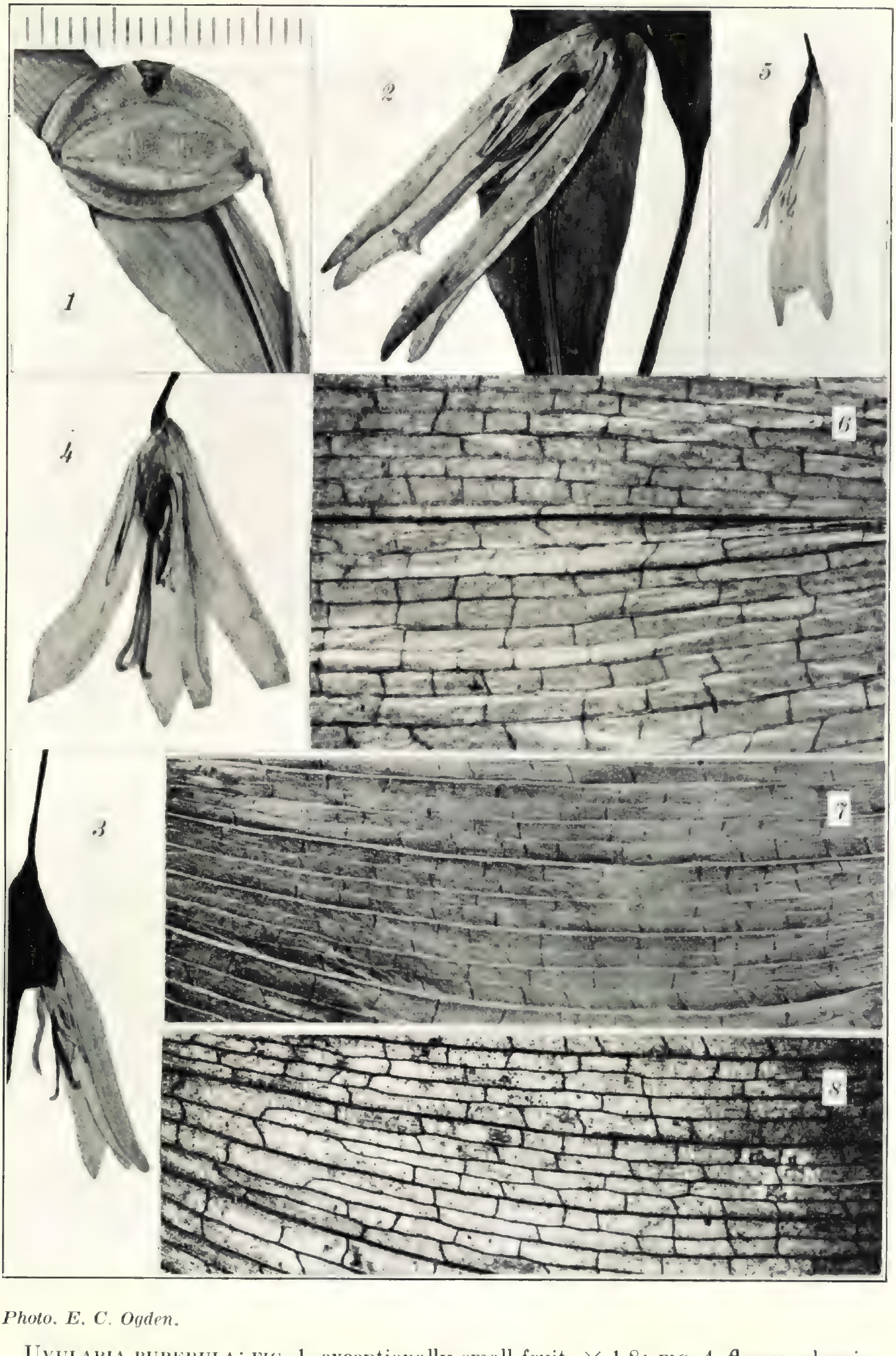

Photo. E. C. Ogden.

Uvularia puberula: fig. 1, exceptionally small fruit, × 1.8; fig. 4, flower, showing long style, × 1.8; fig. 5, flower, showing relatively long anthers, × 1.8; fig. 7, lower surface of leaf, by reflected light, × 5; fig. 8, reticulation of same leaf, by transmitted light, × 5.

U. puberula, var. nitida: fig. 2, flower, showing long style, × 1.8; fig. 3, flower, showing relatively long anthers, × 1.8; fig. 6, lower surface of leaf, × 5.

Photo. H. G. Fernald.

Hypoxis Longii: fig. 1, fruiting plant, × 1; fig. 2, flower, × 5; fig. 3, flower, mechanically opened, × 10; fig. 4, summit of capsule, × 10; fig. 5, dehisced fruit, with seeds, × 10; fig. 6, valves of capsule, × 10; figs. 7 and 8, seeds, × 12.

to 17, 1914, *Hunnewell,* with three flowering plants. I have removed the covering sepals from two flowers; one of them (FIG. 4) has the style elongate as in theoretical *U. nitida,* the other (FIG. 5) has the short style and long anthers of the Tom's River sheet of *U. nitida.* The styles, like the capsules, fail to give the sharp differentiation one would wish between *U. puberula* and *U. nitida.* In fact, it becomes evident that *U. puberula* (including *nitida*) exhibits heterostyly.

The leaves of *U. nitida* are, as Mackenzie maintained, thinner than in *U. puberula* and the reticulation is less prominent on the back; but it is of the same pattern. FIG. 6 shows the pattern of the reticulation, × 5, by reflected light of a leaf from some of Britton's original collection of his *Oakesia sessilifolia,* var. *nitida;* FIG. 7, the pattern, × 5, also by reflected light (showing shadows), from a leaf of *U. puberula* from Henderson Co., North Carolina (*Wiegand & Manning,* no. 856, as *U. sessilifolia*); and FIG. 8 is a portion of the same leaf photographed by transmitted light, × 5. The reticulate pattern is not sufficiently different for species.

Somewhere on the angles of the stems of *Uvularia puberula* one can usually find puberulence; the angles in *U. nitida* are glabrous. So far as I can make out this and the thinner leaf with reticulation less prominent beneath are the characters which separate *U. nitida.* I am, therefore, treating it as a variety of the coastal plain. The occurrences on the outer coastal plain of isolated colonies of Alleghenian types and the persistence in the Alleghenies of relic colonies of coastal plain types are so numerous that it is not unnatural that *Uvularia puberula* should have its coastal plain representative.

Kearney reported *U. puberula,* var, *nitida* (as *U. sessilifolia nitida*) from Suffolk, where many pine-barren species occur.[1]

UVULARIA SESSILIFOLIA L. Dry clay of open woods and thickets, north of Blackwater River, no. 3860.

SMILAX TAMNIFOLIA Michx. Wet woods near Great Bridge, no. 3856.

DIOSCOREA VILLOSA L. *D. paniculata* Michx.; Bartlett, U. S. Dept. Agric. Bur. Pl. Ind. Bull. no. 189: 15, map 3 (1910). Wet woods, south of Great Bridge, Norfolk Co., no. 3861; and seen in several other stations in Norfolk and Princess Anne Cos.

Bartlett rejected the name *Dioscorea villosa,* because he felt that the specific name was applied to the plant of northeastern America

[1] Fruiting material (*Fernald, Long & Fogg,* no. 4843) collected September 11, 1935 on a bank in dry woods at Kilby (slightly west of Suffolk) is typical Alleghenian *U. puberula,* with the firm leaves superficially reticulate beneath, the mature capsules 2.2–3.3 cm. long.

through confusion with some other and truly villous species. He admitted that the Clayton plant from Virginia (no. 94), which had been described by Gronovius and which Linnaeus had personally examined, had been accepted as the type. In view of the general confusion of citations given by Linnaeus for this, like a large proportion of his American species, the typification becomes highly abstract unless we accept the specimen which Linnaeus had had before him as final. In this case the typification had already been made and only confusion results by shifting it.

In his map and his citation of specimens, although admitting that Clayton's plant (presumably from southeastern Virginia) was what he chose to call *D. paniculata*, Bartlett gave no entries from south of Maryland. Our material, perfectly typical of the plant with pilose leaves, comes from within 10 miles of the North Carolina line, from the swampy area known as "The Green Sea," between Breat Bridge and Benefit.

Hypoxis **Longii**, sp. nov. (tab. 393), cormo cylindrico 0.7–1.2 cm. crasso; foliis linearibus firmis 1.5–3.5 dm. longis 2–4 mm. latis sparse villosis, vaginis membranaceis griseo-brunneis; pedunculis filiformibus pilosis anthesi vaginis inclusis deinde elongatis ad 6 cm. longis unifloris; bracteis 1–2 lineari-filiformibus 3–4 mm. longis caducis; floribus inclusis clausis; ovario 3–4 mm. longo clavato dense albido-piloso; sepalis lanceolatis 3 mm. longis 1 mm. latis dorso pallide viridibus longe piloso barbatisque, ventro albidis 5-nerviis; petalis albidis lanceolatis 2 mm. longis 0.5 mm. latis; antheris basifixis lanceolato-attenuatis, 0.8–1 mm. longis, basi cordatis; capsulis crasse clavatis 0.8–1 cm. longis 3–4 mm. latis sepalis albido-villosis conniventibus 4–5 mm. longis coronatis, apice mox circumscissis inferne valvis tribus dehiscentibus, sepalis caducis; seminibus crasse cylindricis vel anguste obovoideis 1.5–2 mm. longis diametro 0.8–1 mm. latere hilo rostrato conspicuo, testa olivaceo-nigrescentibus iridescentibus minute alveolatis.—Virginia: damp peaty or sandy depressions back of the dunes, Rifle Range, south of Rudy Inlet, Princess Ann County, August 4, 1934, *Fernald & Long*, no. 3862 (type in Gray Herb.; isotype in Herb. Phil. Acad.), June 16, 1935, *Fernald, Griscom & Long*, no. 4609.

Hypoxis Longii is, in several characters, the most extreme American species of the genus. Ordinarily the American species have the capsules quite indehiscent and permanently crowned by the connivent perianth-segments which form a beak. So generally is this the case that a botanist familiar with the Atlantic North American *H. hirsuta* (L.) Coville or the common tropical American *H. decumbens* L., is puzzled by the definition given in certain Old World treatments of *Hypoxis:* "In Hypoxis it [the fruit] is a capsule which slits off by

circumscissile dehiscence below the operculum, and then sometimes, but not always, breaks up into three loculicidal valves"—Baker, *A Synopsis of Hypoxidaceae*, Journ. Linn. Soc. xvii. 97 (1878); and "Capsula . . . demum (an semper?) subapice circumscisse dehiscens"—Benth. & Hook. Gen. Pl. iii. 717 (1880). More consistent with our usual American experience is the definition of Hutchinson: "Fruit either a capsule and mostly crowned by the persistent perianth, opening by a circular slit or by short vertical slits near the top, or indehiscent and fleshy"—Hutchinson, Fam. Fl. Pl. ii. Monoc. 166 (1934).

When we first detected *Hypoxis Longii* the feature which attracted us was a remarkable membranous, white and 3-cleft structure (FIG. 6) which appeared like a 3-parted perianth, involucre or spathe. Soon we found some (FIG. 5) bearing the long central placenta covered with olive-black seeds, looking like a spadix with rudimentary flowers; and finally we got plants with flowers in all stages from anthesis (FIG. 2) to maturity of the capsules (FIGS. 1 and 4). The flowers (FIG. 1) hidden in the sheaths, did not expand, but the scape promptly elongated, the capsule enlarged and we could only conclude that we were dealing with a cleistogamous species. Digging specimens from the peat we were amazed to see the perianth-segments promptly drop off and the three white valves of the capsule as promptly separate and roll back, exposing the seed-covered placenta. The disturbance caused by removing the plants from the soil so promptly induced this startling reaction, completed in a few seconds, in all full-grown capsules that we found it difficult to secure material young enough to retain the flowers and capsules intact. That was early in August, 1934, when flowers and fruits in all stages were present. In May, 1935, Mr. Griscom and I could find no signs of the plant at the original (and only known) station, but in mid-June he, Mr. Long and I secured a good series, with flowers, as always, unexpanding, well-grown fruit and circumscised and dehisced capsules.

Hypoxis Longii, therefore, has capsules of the most extreme type described by Baker, who defines only a few species, all in his subgenus *Ianthe*, suggesting it: "capsula turbinata membranacea infra collum circumscissa" (*H. stellata* from the Cape of Good Hope); "Capsula . . . medio circumscissa, demum irregulariter trivalvis" (*H. pusilla* of New Zealand, Tasmania and Australia); and "Capsula . . . infra collum circumscissa, valvis haud dehiscentibus" (*H. glabella* of Australia and Tasmania). The subgenus *Ianthe*, known to

Baker only from the Australian region and South Africa and containing some species with capsules dehiscent into 3 valves, has basifixed anthers; Baker's subgenus *Euhypoxis,* containing the bulk of the genus, has them versatile. It is, therefore, of the highest significance that mechanical opening out of a flower (fig. 3) of *H. Longii* exposes the basifixed anthers of *Ianthe.*

In Miss Brackett's detailed *Revision of the American Species of Hypoxis,*[1] she recognized only one species in America with the basifixed anthers of subgenus *Ianthe.* This was the very rare *H. sessilis* L., which has a large open yellow perianth. In her account Miss Brackett quoted from a letter from M. A. Curtis to Asa Gray, written in September, 1853, accompanying over-mature autumnal material of *H. sessilis* from Society Hill, South Carolina: "I send also an abortive Hypoxis now not uncommon here as a second growth of the season. Flowers 3-cleft, white." Miss Brackett also referred to material of *H. sessilis* sent by Miss Bragg from Dackon, Berkeley Co., South Carolina, June 21, 1920, as having "flowers . . . only three-cleft." Examination of the Curtis and the Bragg material clearly shows that what Curtis took for "abortive" 3-cleft white flowers and what Miss Brackett evidently so interpreted are the dehisced and empty capsules. *H. sessilis,* therefore, like *H. Longii,* belongs to subgenus *Ianthe,* not only in its basifixed anthers, but in its circumscissile capsules which soon split into 3 membranous valves. The seeds are very similar in both, olivaceous and covered with a closely reticulate iridescent testa and with the rostrate hilum lateral, instead of subterminal. The distinctions between the two follow:

H. sessilis. Perianth expanding, with rotate limb 1.5–2 cm. broad, bright yellow above; sepals and petals 6–9 mm. long, 2–4 mm. broad, the sepals only sparingly pilose on the back; capsule pyriform, 3–4 mm. long, the tardily deciduous beak fully twice its length, 6–10 mm. long; seeds coarsely reticulate, golden-brown to pale olive.

H. Longii. Perianth remaining closed, when dissected open 5 mm. broad; sepals and petals 2–3 mm. long, 0.5–1 mm. broad, whitish above, the sepals with very long white appressed beard extending far beyond the tips; capsule thick-clavate, 8–10 mm. long, promptly circumscissile at summit, throwing off the beak, then promptly splitting from the apex into 3 membranous whitish valves; beak (before circumscission) about half as long as capsule, 4–5.5 mm. long; seeds olive-black, more finely reticulate.

Hypoxis Longii is known from only a single small area, where it is associated with a series of austral species of peats and damp sands: *Panicum ensifolium* Baldw., *Rynchospora rariflora* (Michx.) Ell., *R.*

[1] Rhodora, xxv. 120–147, 151–155 (1923).

Wrightiana Boeckl. and *R. cymosa*, var. *globularis* Chapm., *Lobelia Nuttallii* R. & S., etc. Search southward to the North Carolina line has thus far failed to show another colony of it. Very similarly, *H. sessilis* is an extremely scarce plant; only a few stations for it are known and in writing of the colony in Berkeley Co., South Carolina, Miss Bragg said: "I spent over an hour searching for specimens in the one locality where these were gathered but, though I am sure there were many more, I could find only two specimens with seeds. The plants are indistinguishable from single tufts of broom grass until you get down to them in back-breaking fashion." Similarly, at the one spot in Virginia where *H. sessilis* has been found (Dam Neck, Princess Anne Co., *Fernald & Griscom*, no. 4368), a few miles south of the colony of *H. Longii*, Mr. Griscom and I found a single individual in May, 1935. Search then and again in June has failed to bring to light a second plant. We took the flowering top and left the corm! As last remnants on the Coastal Plain of North America of the ancient flora now concentrated in Australia no better illustrations could be found than these members of *Hypoxis*, subg. *Ianthe.*

HABENARIA CRISTATA (Michx.) R. Br. Occasional in sandy woodlands: Cape Henry, no. 3878; Dam Neck, no. 3879; Munden, no. 3880; abundant in wet, peaty clearings in woods of *Pinus serotina*, south of Grassfield, no. 3881.

POGONIA OPHIOGLOSSOIDES (L.) Ker. Occasional in boggy swales and peaty depressions: Rifle Range, no. 3876; False Cape, no. 3877.

GOODYERA PUBESCENS (Willd.) R. Br. Occasional in rich woods: Little Neck, no. 3871.

LIPARIS LILIIFOLIA (L.) Richard. Occasional in rich woods: Little Neck, no. 3869, also *F. G. & L.*, no. 4623; Great Neck, *F. & G.*, no. 4375.

MALAXIS UNIFOLIA Michx. Scattered, usually as 1 or few individuals, in rich woods: Little Neck, no. 3870; Back Bay, *F. G. & L.*, no. 4622.

(*To be continued*)

THE WANING OF ARCEUTHOBIUM AT CONCORD, MASSACHUSETTS.—An interesting chapter in local botanical history has just been closed by the extinction of the recently discovered station for *Arceuthobium pusillum* Link at Concord, Massachusetts.[1]

Writing of the black spruces at this precise locality, under date of February 12, 1858, Thoreau remarks:

[1] RHODORA, **33**: 92 (1931).

> About the ledum pond hole, there is an abundance of that abnormal growth of the spruce. Instead of a regular free and open growth you have a multitude of slender branches, crowded together, putting out from the summit or side of the stem and shooting up perpendicularly with dense, fine wiry branchlets, and fine needles which have an impoverished look, all together forming a broom-like mass very much like a heath.

Obviously, Thoreau saw but failed to discover what was perhaps the rarest plant in Concord, and which remained unknown to science until 1871. Little did he suspect that under his very eyes was the dwarf mistletoe, occurring along the southeastern limit of its range.

In any event, the owner of the small pond hole where this interesting plant grew has cleared away most of the surrounding vegetation with a zeal comparable to that of the director of the E. R. A. himself. However, he did spare the single infected spruce at the request of a botanical crank who happened by. Unfortunately, his forbearance was of no avail. The lonely spruce, succumbing to the pitiless glare of unaccustomed publicity, has died within the last few months, carrying the mistletoe with it to its grave.—R. J. EATON.

ANOTHER NEW JERSEY STATION FOR NAJAS GRACILLIMA.—Abundant with *Najas flexilis* in a pond hole east of Cedar Lake, Denville (*Svenson* no. 5477). The only previously known locality in New Jersey is "Delanco, mouth of Cooper's Creek, Palatine, Woodstown," cited by Stone (Rept. N. J. State Mus. 1910. 166 (1911)), a station sixty miles to the southward.—H. K. SVENSON, Brooklyn Botanic Garden.

TWO RANGE EXTENSIONS.—The finding of *Betula nigra* L. in the township of Barrington, Strafford County, New Hampshire, and *Krigia virginica* L. on Georgetown Island, Sagadahoc County, Maine, both give northeastern extensions of range.

The Red Birch was discovered by the writer in 1931 on the gravelly eastern shore of Mendum's Pond. One large living tree is present and a considerable number of smaller ones, none of which is more than a few hundred feet from the parent. The only station previously reported for the state is Beaver Brook, Pelham (*F. W. Batchelder*). This stream is a tributary of the Merrimac River and is only a few miles over the Massachusetts state line. Mendum's Pond is over thirty miles northeast and drains into Great Bay.

The writer chanced to see the inconspicuous *Krigia virginica* while collecting Lecheas. The habitat was a rocky roadside in the partial shade of *Picea* sp. and *Abies balsamea.* The nearest recorded station is in the township of Wells, Maine, at least fifty miles southwest of Sagadahoc County.

Specimens have been placed in the herbarium of the New England Botanical Club.—A. R. Hodgdon, Gray Herbarium.

NOTES ON SOME RARE PLANTS OF YORK COUNTY MAINE

Anne E. Perkins

Having returned to Berwick, York County, Maine three years ago, after a long absence, I have been giving considerable attention to the natural history of my native county and state. Among the many plants which I have collected these few years are a number of species of rare occurrence in Maine, which some of my correspondents have urged me to report. Specimens of some of these species have been sent to Gray Herbarium, and to the Portland Society of Natural History, and all of my York County specimens are in the Herbarium of Cornell University.

Thelypteris hexaganoptera. Waterboro, York County, has a large station of this fern.

Carex vestita. This sedge literally invests whole marshes at Wells Beach.

Juncus Torreyi. In September 1932, I found a large station of this rush just above the shore of the estuary of the Salmon Falls River in South Berwick. During the season of 1933, I found very little of the plant, as the entire piece of ground was ploughed, the first time that I have known it to be disturbed. During the season of 1934 the plant had disappeared.

Iris prismatica. This still occurs freely on the marshes of Wells Beach.

Acnida cannabina. This occurs in profusion in the estuary of the Salmon Falls River at South Berwick.

Anemonella thalictroides. This plant, which I have every reason to know grew formerly in Berwick has not yet been established in Maine by a specimen. There is a patch of it in New Hampshire just across the river from South Berwick, not a long stone's throw from South Berwick.

Cimicifuga racemosa. This I have collected twice in North Berwick in woods not far from Bauneg Beg Pond, and also by the wayside.

Podophyllum peltatum. A large circle of this plant in a pasture in Alfred, planted there many years ago by the Shakers who had a

colony there for many years, thrives and appears year after year. It is not known to have spread from the original planting.

Sassafras variifolium. Occurs freely in North Berwick, Sanford and York. I recall it from childhood in Sanford and North Berwick, and at present in both places there are some of the largest trees that I have seen anywhere. At Oak Hill, Sanford it is plentiful on the property of Herbert Allen; his father used to make stanchions of the wood in his barn.

Benzoin aestivale. This I found in Eliot in 1934, and though through the cutting of bushes all of the large plants were cut, there are now quite a number of young sprouts appearing by the road side. This had not been found in forty years. It was reported in York County by Dr. Aaron Young in 1847, and about forty years ago it was collected in North Berwick by John C. Parlin.

Tillaea aquatica. Collected in the estuary at South Berwick in 1934.

Cytisus scoparius. Apparently established at Perkins Cove, Ogunquit in Wells. It was severely affected by the severe winter of 1933–34.

Lathyrus pratensis. I first collected this plant at Stromberg Corner, North Berwick, in 1927. It now covers a large area there.

Kalmia latifolia. A station in Wells, covering perhaps half an acre, has suffered greatly from the wanton breaking of bushes and digging of the plants by those who come miles for it. A large station of *Rhododendron maximum* in Sanford suffers similar depradations.

Samolus floribundus. Quite plentiful in the estuary of South Berwick.

Pycnanthemum flexuosum. Has grown in Berwick for many years.

Pycnanthemum muticum. I first found this plant in Berwick in August 1919; since that time it has increased. It grows along the road side less than a mile from our house.

Limosella subulata. Collected in 1934 on the estuary, Berwick.

Bidens hyperborea. Has been collected in brooks in Berwick and along the Salmon Falls River at South Berwick.

Berwick, Maine.

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NOTES ON THE FLORA OF THE STATE OF WASHINGTON—III

J. William Thompson

By continued exploration and study, I have been able to add some more interesting records for this State, as follows:

Poa interior Rydb. Dr. Hitchcock reports that Mr. Suksdorf found this species in Spokane Co., and to this record can be added mine from much farther west: "base of Three Brothers along Nigger Creek, Kittitas Co., 900 m., *Thompson* 10531."

Carex saximontana Mack. While hiking to Billy Goat Pass in Okanogan Co., I noticed a peculiar grass-like sedge by the trail beneath yellow pines. It agrees very well with the above, except the achenes are larger than given by Mr. Mackenzie. It is a new record for this State, being from "lower slopes of Billy Goat Mountain, 800 m., *Thompson* 10898."

Carex sychnocephala Carey. Mr. Chas. B. Fiker, Okanogan orchardist, still finds time to steal away from fruit raising long enough to turn up interesting things from that interesting and little-known region. In his collection of 1933 was a Carex, one so strikingly different from anything I had previously seen that I at first thought it must be undescribed. But rather than run the risk of merely making another useless synonym, I was willing to consult someone who was in a much better position than I to compare it with known species of its group. I appealed to Dr. Svenson, and he reported the specimen to be typical *Carex sychnocephala* Carey. This constitutes a remarkable extension in range for the species, being found "on shore of Little Goose Lake southeast of Omak, 26 July 1933, *Fiker* 1295 and 1304."

Salix brachycarpa Nutt. Two years ago, while descending from a high ridge in the Mount Stuart region, I hastily collected a slender willow by a spring above Beverly Creek. Dr. Ball tentatively called it *Salix brachycarpa* Nutt. This past season, while botanizing along

Bowlder Creek, twenty-five miles west of the Mount Stuart location, I again found the willow, this time in great abundance by the banks of the mountain stream. I made a large collection of both staminate and pistillate plants, and when submitted to Dr. Ball, he pronounced them typical *S. brachycarpa,* and our records for the species are: "by spring on steep slope, head of Beverly Creek, Kittitas Co., 1200 m., 17 August 1932, *Thompson* 8885; margin of mountain stream, along Bowlder Creek, Kittitas Co., 1000 m. 18 June 1934, *Thompson* 10697 and 10698." Both stations are near the altitudinal limit for *Pinus ponderosa.*

Arabis lyrata L. var. kamchatica Fisch. in DC. Syst. ii: 231 (1821). Dr. Hultén[1] states that our northwestern material which has been referred to var. *occidentalis* S. Wats.[2] is identical with the above variety. While on Mount Baker last summer, I found this rather rare crucifer in great abundance at about 1800 meters, just below perpetual snow. Mr. Suksdorf's collection cited by Piper[2] must have grown from a chance seed that had been washed down from the higher altitudes where I found it. In spite of the dense fog and the twelve long weary miles back to the town of Glacier all alone, I took time to pick up several very interesting species in just a few minutes: *Poa alpina* L., *Saxifraga Lyallii* Engl., *Epilobium latifolium* L., *Smelowskia ovalis* M. E. Jones, and *Senecio Elmeri* Piper, and also an *Arabis* sp. with flat erect pods, as yet undetermined. Exact station for the crucifer was "Heliotrope Ridge, Mount Baker, Whatcom Co., 1800 m., *Thompson* 11239."

Lepidium campestre (L.) R. Br. A large patch of apparently this species was found by an artificial pond made by irrigation overflow, five miles east of Cle Elum, Kittitas Co., 9 May 1934, *Thompson* 10413.

Teesdalia nudicaulis (L.) R. Br.; Ait. f., Hort. Kew. ed. 2, iv: 85 (1812). Last spring while botanizing in those peculiar prairies just south of Tacoma, I found a peculiar *Lepidium*-like crucifer, the identity of which puzzled everyone who examined it. Several weeks ago I happened to read Dr. Blake's[3] account of having found a crucifer which was not in any of our manuals. The description given by him seemed to fit my plant, and I started on a search through European floras for a description and perhaps a cut. I found an excellent figure in Lindman's *Bilder ur Nordens Flora,* plate 208. The plate matched my collection exactly. A few days after this, I received a letter from Mr. John Thomas Howell of the California Academy of Sciences, and he also had hit upon the identification of my crucifer, but in an entirely different manner. Then to make it all the more interesting, I received another collection from Mr. I. C. Otis, who had found it in another county. Those prairies were thoroughly botanized by Prof. J. B. Flett years ago and if it was there then, it is not likely that his keen

[1] Hultén. Flora of Kamtchatka ii: 165 (1928).
[2] Piper. Contr. U. S. Nat. Herb. xi: 292 (1906).
[3] Rhodora xxxvi: 413 (1934).

eyes would have overlooked it. We can conclude then that the species has been recently introduced, but how and when is unknown. Now to Dr. Blake's eastern records can be added ours as follows: "gravelly prairies near Roy, Pierce Co., 6 April 1934, *Thompson* 10101; south of Tumwater (near Olympia), Thurston Co., *I. C. Otis* 1845.

Draba aureola S. Wats. Late in the season of 1933, three of us climbed up the slopes of Mount Rainier to the foot of Flett Glacier, where we found this rare *Draba* growing in great abundance in the barren moraines where it seemed impossible for a plant of any kind to grow. Associated with it were *Smelowskia ovalis* M. E. Jones, *Cardamine bellidifolia* L., and *Polemonium elegans* Greene. Nearly every *Draba* was freely branched, and this surprised us not a bit since Dr. Henderson[1] states that "specimens from Mount Rainier . . . are unbranched," and concludes that the branched specimens he has from the North Sister of Oregon are entitled to varietal rank as var. *paniculata.* This kind of reasoning makes one wish that there could be more real research done before rushing into print with a new species or variety. I am sure that this species will be found to be branched from even its type locality, provided it is collected late enough in the season! The branched form "growing in the moraines of Flett Glacier, Mount Rainier, 1800 m., 27 August 1933, *Thompson* 10001" was widely distributed.

Delphinium viridescens Leiberg. This species has eluded me every year until last summer when I found it abundant in Camas Land, and in a bog on Tip Top peak nearby. It prefers to grow in decidedly moist situations somewhat in the open. The large collection I made has been widely distributed as from "bog on Tip Top, 1000 m., Chelan Co., 26 June 1934, *Thompson* 10793."

Saxifraga adscendens L. Prof. Flett found this many years ago in the mining region of Mount Baker; it is cited by Piper, but omitted entirely from the very incomplete "Flora of Mount Baker," by St. John and Hardin.[2] Last summer while botanizing on Skyline Ridge, a northern extension of Mount Baker, my assistant found several plants growing among *Romanzoffia sitchensis*, and they could easily have been mistaken for immature plants of the latter, until the flower was carefully examined. For the sake of permanent record, the collection was distributed as from "partially shaded cliff on Skyline Ridge, Mount Baker, 1500 m., *Thompson* 10980." One tiny plant was later found in Marmot Pass, Olympic Mts., about 1600 m., by my same assistant, Mr. Howard S. McGee.

Penstemon **Nelsonae** Keck & Thompson, sp. nov., herba perennis 5–9 dm. alta usque ad basim inflorescentiae glaberrima; rhizomatibus prostratis moderati lignescentibus; caulibus paucis erectis virgatis; foliis integris vel obscure obsoleteque denticulatis crassiusculis paullo glaucis, basilibus lanceolatis ad basim apicemque acuminatis 5.5–13

[1] Rhodora xxxiii: 204 (1931).
[2] Flora of Mount Baker, in Mazama xi: 52–102 (1929).

cm. longis 9–17 mm. latis, petiolis gracilibus laminis fere aequalibus, caulinis sessilibus lanceolatis vel ovato-lanceolatis basi amplexicaulibus ad 12 cm. longis ad 40 mm. latis gradatim reductis quam internodiis brevioribus; thyrso virgato spiciformi interrupto glandulari-pubescenti, pedunculis cymularum (8–10 geminis) brevibus appressis; calyce 5.5–7.5 mm. longo, lobis lineari-lanceolatis attenuatis integris herbaceis vel anguste scarioso-marginatis; corolla flava 17–21 mm. longa exteriore glandulari-puberula, tubo superne sensim modice ampliata, fauce 5 mm. crassa, limbo breviter bilabiato patenti, labio inferiore intus pilis albis barbatis; staminibus fertilibus inclusis glaberrimis, loculis antherarum usque ad apicem dehiscentibus 1.0 mm. longis ovato-oblongis, filamento sterili apice superne dense flavo-barbato; capsula 5–6 mm. longa, ovoidea; seminibus numerosis acutangulis, testa sulphurea-marginata.

Type: Burned over land at base of Mt. Angeles, Olympic Range, Clallam County, Washington, at 550 m. (1800 feet) altitude, June 9, 1934, *J. William Thompson* 10617 (Dudley Herbarium of Stanford University; isotypes in Carnegie Institution, and in private herbarium of J. William Thompson). The only other known collection of this species is from Mrs. Oscar Nelson's garden, within a few hundred feet of the exact type station, *Thompson* 9474 (Thompson, C. I.). This may be known as the cotype, as the plant was brought into the garden from the type locality.

It is a pleasure indeed to name this handsome species in honor of Mrs. Oscar Nelson, in whose delightful wild flower garden it was that Mr. Thompson first saw the plant in full bloom. On inquiring from where it came, he was very much surprised when Mrs. Nelson pointed to the burn just back of her house. Mt. Angeles has been visited by scores of botanists, nearly all of whom have seen Mrs. Nelson's wonderful rockery of native plants, and how the species has escaped notice all this time is a mystery. Later search was rewarded by finding three plants still persisting among the second growth fir and bracken. The plant grows in a region that has been swept over by successive forest fires, and probably represents the remnant of a once abundant species. It makes a showy garden plant, and it should be introduced into cultivation. However, seed from the garden specimen failed to germinate for Mr. Thompson.

Penstemon Nelsonae belongs in the section *Graciles* Pennell. Our material would indicate it to be composed of the largest individuals in the section, the other species seldom attaining the height of 5 dm. The stout stems of *P. Nelsonae* may attain a thickness of 8 mm. Morphologically, the nearest known relative of *P. Nelsonae* appears to be *P. attenuatus* Dougl., a species of eastern Washington and adjacent Idaho. The two are similar in having glabrous herbage except for the

glandular-pubescent inflorescences, in glandular-puberulent corollas with bearded lower lip, in yellow-bearded staminodes and in general shape and size of flowers. *Penstemon Nelsonae* is of larger stature throughout than *P. attenuatus.* It is further removed from this and the other species of the *P. confertus-procerus* complex by the denticulations of the leaves. Our new species is well isolated from the other species of the section *Graciles* excepting the small-flowered *P. procerus* Dougl. (the form *P. Tolmiei* Hook.), and it is the only yellow-flowered *Penstemon* occurring west of the Cascades in Washington.

Aster meritus A. Nels. (*A. bakerensis* St. John). Dr. Muenscher[1] has already reviewed the "Flora of Mount Baker," and expressed his surprise to find so many species common to the region that were omitted by the authors. On one short visit there, I found thirty-three species not in the Flora, and strangely enough, I found most of them near their base camp, Mount Baker Lodge. Since its publication, I have made several visits there, and paid especial attention to the forms and species which were described as new. Specialists to whom I have submitted this material have reduced the new species one by one until only *Aster bakerensis* remained. I made a long, hard trip to Grouse Butte last summer, and found the *Aster* growing in the crevices of the cliffs at about 1000 m., on Grouse Butte, and the specimens were much larger than indicated in the original description. Now Dr. Blake declares this species to be typical *Aster meritus* A. Nels. Dr. St. John in the original description states: "This new species does not appear to have any close relatives in North America," and this positive statement of a well known botanist caused me to doubt Dr. Blake at first. I sent material to Dr. Aven Nelson to compare with the type, and his ready agreement with Dr. Blake removes all doubts. But it is an interesting extension in range. My collection "Grouse Butte, Mt. Baker region, 1000 m. 10 August 1934, *Thompson* 11225," has been widely distributed.

Cleveland High School, Seattle.

Viola rotundifolia on Long Island.—In the fall of 1931 an unusually broad-leaved violet was found on the terminal moraine north of Queens Village. Fruiting material obtained the following spring (*Svenson* no. 4746) showed conclusively that the species was *Viola rotundifolia,* which is mentioned from a "single station on L. I." by Taylor, Fl. Vic. N. Y. 453 (1915). This is perhaps based on the citation, "Long Island City, Hon. A. Brown" in Jelliffe, Fl. Long Island 117 (1899), but Mr. Wilson could not locate any specimen in the herbarium of the New York Botanical Garden. The area has

[1] Torreya, xxxi: 15 (1931).

been improved for park purposes, and at the last visit (1932) the number of plants was sadly depleted. When first noted the plants were abundant over an area approximately fifty feet in diameter in woodland consisting of *Cornus florida* and oaks.—H. K. Svenson, Brooklyn Botanic Garden.

Collinsia parviflora in New England.—On June 8, 1935, Mr. S. K. Harris, my wife and I made an afternoon's visit to a group of abrupt and conspicuous slate hills in the town of Pawlet, Vermont. They rise to an altitude of about 2,000 feet; one of them, locally known as Haystack, has a considerable cliff on its western face. This we especially explored. The summit offered nothing more exciting than *Deschampsia flexuosa, Pyrus melanocarpa, Potentilla tridentata, Vaccinium pensylvanicum* and *Rhododendron roseum.* The lesser rock-outcrops and wooded slopes below, however, produced a soil sufficiently rich to support such at least mildly calcicolous species as *Cystopteris bulbifera, Arenaria stricta, Ranunculus allegheniensis, Arabis hirsuta, Draba arabisans* and *Waldsteinia.* At the base of the cliff, on shaded talus, we found a small patch, scarcely three feet square, of an unfamiliar little annual, which Professor Fernald later identified as *Collinsia parviflora* Dougl.

This species has a wide range in the western United States; east of the Rocky Mountains, however, it is known, so far as I am aware, only from the region of the Black Hills in South Dakota and from the Keweenaw Peninsula in Michigan and locally at Belleville, Ontario. The woods on Haystack have been thoroughly lumbered in the past: old cartpaths run here and there all through them. Some one has built a brush fence up to the very foot of the cliff; and catnip and *Barbarea vulgaris* are among the associates of *Collinsia* on the talus. It may conceivably have been introduced with western feed and somehow found a congenial, though precarious, abiding place under the Haystack cliff. On the other hand, "wooded hillsides" are among the rather varied natural habitats assigned to it by collectors in the West and, as above noted, there are no records of this "montane and submontane" species as a weed in the East. Possibly its occurrence at Pawlet may be considered an outlying native station, comparable (though much farther from its nearest neighbor) to that of *Carex Richardsonii* on Mt. Equinox, not far away.[1] —C. A. Weatherby, Gray Herbarium.

[1] See Fernald, Rhodora xxxiv. 229 (1932).

MIDSUMMER VASCULAR PLANTS OF SOUTHEASTERN VIRGINIA

M. L. Fernald

(*Continued from page 413*)

Salix sericea Marsh. Wet peaty clearings in woods of *Pinus serotina*, south of Grassfield, no. 3887.

It is most surprising to find this essentially northern and continental species growing in typical wet pine barren, with characteristic austral plants such as the *Myrica* next noted. *S. sericea*, as previously represented in the Gray Herbarium from Virginia, has come from the piedmont and mountains only.

Myrica Curtissi Chevalier, var. media (Michx.) Cheval. Mon. Myric. 186 [270] (1901). Wet peaty clearings in woods of *Pinus serotina*, south of Grassfield, no. 3890 (small-leaved form).

This is the first record of any form of *Myrica Curtissi* from north of South Carolina; but several specimens from southern New Jersey belong to var. *media*. We have three species of Wax Myrtle or Candle Berry north of Florida. *M. cerifera* L. (including true *M. caroliniensis* Mill., not recent authors) is either a shrub or tree with the coriaceous and evergreen narrowly oblanceolate leaves varying from entire to sharply serrate, and with the smallest fruit of our three species. *M. Curtissi* Cheval. is also evergreen, with coriaceous lustrous foliage oblong to narrowly obovate. The typical form of the species has glabrous foliage and branches, but var. *media* has the expanding leaves strongly pubescent, the mature leaves more or less velutinous and the dark (blackish) bark of the branches permanently somewhat pubescent. Its fruits are described as slightly larger than in *M. cerifera*. The third species is the deciduous-leaved shrub or small tree of the Atlantic slope: leaves oblong to narrowly obovate, submembranaceous, opaque; bark of mature branches whitish-gray and glabrous; fruits 3.5–4.5 mm. in diameter. This shrub, extending north to southern Newfoundland and the Magdalen Islands, is erroneously passing as *M. caroliniensis* Mill. Miller clearly described the variation of *M. cerifera* with most serrate leaves and cited for it a characteristic plate of Catesby. The wrong interpretation of *M. caroliniensis* is clearly discussed by Chevalier, who correctly takes up for the deciduous-leaved and northern species the name *M. pensilvanica* Loiseleur. Loiseleur gave a beautiful characterization of the northern Bayberry and an excellent plate. The name *M. pensilvanica* had formerly crept into horticultural lists but its first clear definition seems to have been that of Loiseleur.

Typical glabrous Myrica Curtissi was extended northward into Virginia in May, 1935: pine woods near Benefit, *Fernald & Griscom*, no. 4380.

Carpinus caroliniana Walt. Common in swampy woods or occasionally in dry woods: Blackwater River, no. 3894; west of Pungo, *F. & G.*, no. 4382.

Carpinus caroliniana (plate 394) in the swamps and wet woods of southeastern Virginia looked strange to our northern eyes. Its slender trunks were covered with ashy-gray bark, instead of the steel-blue or blue-gray cortex which in the North gives the tree the name "Blue Beech." The leaves, too, looked unfamiliar, small and oblong, with very short teeth, suggesting, very superficially, those of *Amelanchier oblongifolia*. Study in the herbarium shows, indeed, that all the material from the southern coastal plain, from Florida to eastern Texas, thence north into southernmost Illinois and to eastern Virginia, the leaves of the fruiting branches are oblong to narrowly oblong-ovate, 1–3.5 (very rarely –4) cm. broad, 2.5–8 cm. long, acute (but not subcaudate) at tip, with comparatively low serration (figs. 6–10), the small teeth rarely 1 mm. long. The bracts (figs. 2–5) of the fruiting ament are obtuse or subacute, the few teeth blunt or at least not sharp-pointed. The calyx-lobes (figs. 2–5) at summit of the fruit are usually well developed, sometimes quite conspicuous (especially fig. 2).

The tree of the North (plate 395), from Nova Scotia to Ontario and Minnesota, south through the northern states and in the uplands to North Carolina and Arkansas, has bluer bark; it also has larger and more oval leaves with a caudate-acuminate tip, with sharper and longer teeth (figs. 5–7), mostly sharper-toothed bracts (figs. 2–4) and usually very reduced calyx-lobes. That the small-leaved extreme of the southern Coastal Plain is what Walter must have had when he gave his brief diagnosis of *Carpinus caroliniana* in his Flora Caroliniana, written at Santee, South Carolina, there is scarcely a doubt. It, therefore, becomes necessary to find the proper name for the wider-ranging northern and inland tree. It is reasonably certain that it must be *Carpinus Betulus virginiana* Marshall, Arb. Amer. 25 (1785), for Marshall must have had the northern variety; and his characterization of the "oval, pointed leaves, sawed on the edges" is sufficiently definite. Since there is variation in all the characters I feel that the two trees are geographic varieties rather than distinct species. I, therefore, propose to call the larger-leaved variety

Photo. E. C. Ogden.

CARPINUS CAROLINIANA: FIG. 1, fruiting branch, × 1; FIGS. 2–5, bracts and fruits, × 2; FIGS. 6–10, margins of leaves. × 5.

Photo. E. C. Ogden.

Carpinus caroliniana, var. virginiana: fig. 1, fruiting branch, × 1; figs. 2–4, bracts and fruits, × 2; figs. 5–7, margins of leaves. × 5.

Carpinus caroliniana Walt., var. **virginiana** (Marsh.), comb. nov. *C. Betulus virginiana* Marsh. Arb. Amer. 25 (1785). Bark blue-gray; leaves of fruiting branches oval or narrowly ovate, rounded or cordate at base, abruptly subcaudate at tip, 5–12 cm. long, 2.5–6 cm. broad, with sharp and slender teeth, the larger teeth 1–3 mm. long; bracts usually with 1–5 sharp teeth; calyx-lobes at summit of fruit short.—Nova Scotia to Ontario and Minnesota, south to uplands of North Carolina and Arkansas. Plate 395.

Betula nigra L. Local, mostly sprout-growth, perhaps of more general occurrence than appears: wet peaty clearings in woods of *Pinus serotina,* south of Grassfield, no. 3895; sandy pine woods, Sand Bridge, *F. G. & L.*, no. 4629.

Celtis occidentalis L., var. **submembranacea**, var. nov., foliis anguste ovatis apice longe attenuatis maturis submembranaceis utrinque viridibus.—Southeastern Virginia to eastern Georgia. The following are referred here. Virginia: sandy woods, northern end of Knott's Island, Princess Anne Co., August 1, 1934, *Fernald & Long,* no. 3910 (type in Gray Herb.); rich woods, Cedar Island in Back Bay, June 20, 1935, *Fernald, Griscom & Long,* nos. 4630, 4631 (trunks up to 6 dm. or 2 feet in diameter). North Carolina: large trees seen, but no specimens taken, Knott's Island. South Carolina: locality not stated, *M. A. Curtis.* Georgia: bank of Chattahoochee River, Cobb Co., July 9, 1900, *R. M. Harper,* no. 166.

Var. *submembranacea* is at once characterized by having the mature leaves submembranaceous and deep-green on both sides, the other varieties of *Celtis occidentalis* having them firmer and thicker and paler beneath or on both sides. Although Sargent, Bot. Gaz. lxvii. 218 (1919) placed Harper's no. 166 with var. *canina* (Raf.) Sargent, l. c. 217, it has the thin and deep-green foliage of var. *submembranacea,* the mature leaves shriveling or wrinkling in drying.

Aristolochia Serpentaria L. Dry, mixed woods, Little Neck, no. 3913.

Polygonum glaucum Nutt. Sand at upper border of salt marsh, Wachapreague, no. 3919.

P. prolificum (Small) Robinson. Upper border of salt marsh, Wachapreague, no. 3918.

P. opelousanum Riddell. Frequent in sloughs and pond-margins: Pungo, *F. &. G.*, no. 2816.

P. setaceum Baldw. Frequent in swampy woods: Blackwater River, no. 3916; Little Neck, no. 3917.

Chenopodium leptophyllum Nutt. Back of the sand dunes, Cape Henry, no. 3924.

Apparently the first coastal record from south of New Jersey.

Acnida cannabina L. Brackish or saline marshes, frequent: North Landing River, *F. & G.*, no. 2820.

Sesuvium maritimum (Walt.) BSP. Very scarce, damp sand and clay back of the ponds, Dam Neck, no. 3925, only one plant seen.

The first material in the Gray Herbarium from between Delaware and North Carolina.

Arenaria lanuginosa (Michx.) Rohrb. Sprawling and leaning on other vegetation, in dry, mixed woods, and supported on *Smilax* tangle to a height of 1.3 m., Little Neck, nos. 3927, 3928; similar habitat, Great Neck, *F. G. & L.*, no. 4637.

The first records from north of North Carolina.

Aquilegia canadensis L. Rich woods and banks, local, the plants very tall: Little Neck, no. 3930; Great Neck, *F. & G.*, no. 4404.

Caltha palustris L. Very local: along brook in swampy woods, Little Neck, no. 3931.

Anemone virginiana L. Dry mixed woods, Little Neck, no. 3934.

Ranunculus hederaceus L. Wet sand bordering swampy woods and thickets along Back Bay, False Cape, no. 3937; also *F. G. & L.*, no. 4642, growing with strictly indigenous species and seemingly native itself.

Asimina triloba (L.) Dunal. Scattered in rich or swampy woods, the leaves rather smaller than in most inland material, tending to be narrower and more cuneate, thus approaching the foliage of the more southern *A. parviflora* (Michx.) Dunal: Oceana, no. 3940; Great Neck, *F. & G.*, no. 4406.

Decumaria barbata L. Scattered generally through the region, climbing high on trees in rich woods and swamps: London Bridge, no. 3951; Munden, no. 3950; Great Neck, *F. G. & L.*, no. 4648.

Spiraea tomentosa L., var. rosea (Raf.) Fern. Rhodora, xiv. 190 (1912). Local: wet, peaty clearing in woods of *Pinus serotina*, south of Grassland, no. 3955.

Already known from southeastern Virginia, but perhaps isolated there. The material in the Gray Herbarium is otherwise from well inland, from Ontario and Manitoba southward to interior northern Georgia, Tennessee, Arkansas and Kansas. Typical *S. tomentosa*, of acid soils, is not represented in the Gray Herbarium from the coastal plain south of New Jersey. The plant of Grassland is quite like the inland extreme.

Amelanchier oblongifolia (T. & G.) Roem. Common in wet woods, thickets and clearings: Grassfield, no. 3958; North Landing, no. 4426.

A. canadensis (L.) Medic. Rich woods, frequent: Little Neck, no. 3956.

Crataegus Youngii Sarg. The most frequent species seen; scattered in wet woods, swamps and clearings: Grassfield, no. 3960; North Landing, *F. & G.*, no. 4427; Cedar Hill, no. 4428; Virginia Beach, *F. G. & L.*, no. 4651; Cedar Island, no. 4652.

Slight extension north, from North Carolina.

C. Crus-Galli L. Occasional near the coast of Princess Anne Co.: Knott's Island, no. 3961.

Geum virginianum L. (*G. flavum* Bickn.) Frequent in rich woods: Little Neck, no. 3963.

G. canadense Jacq., var. Grimesii Fern. & Weath. Occasional in thickets and borders of woods: Blackwater River, no. 3964; Cedar Island, *F. G. & L.*, no. 4653.

Agrimonia rostellata Wallr. Occasional in rich woods: Little Neck, no. 3966; Little Creek, no. 3969; Virginia Beach, *F. & G.*, no. 2822.

A. mollis (T. & G.) Britton. Rich woods, Little Neck, no. 3967.

A. parviflora Ait. Border of thicket, south of Grassfield, no. 3968.

Albizzia julibrissin Durazzini. Abundantly naturalized in thickets and at borders of woods: Munden, no. 2971.

Tephrosia spicata (Walt.) T. & G. Apparently local: thickets on roadside bank, Creed's, no. 3973.

Lespedeza Stuevei Nutt. Dry woods: Cape Henry, *F. & G.*, no. 2837.

L. intermedia (Wats.) Britt. Dry border of woods, Pungo Causeway, *F. & G.*, no. 3839.

L. repens (L.) Bart. Dry woods, frequent: Virginia Beach, no. 2840.

Desmodium nudiflorum (L.) DC. Rich woods, locally abundant: Little Neck, no. 3988; Virginia Beach, *F. & G.*, no. 2828.

D. Dillenii Darl. Dry pine woods, Cape Henry, *F. & G.*, no. 2826.

D. paniculatum (L.) DC. Rich woods back of Virginia Beach, *F. & G.*, no. 2832.

D. laevigatum (Nutt.) DC. Dry pine woods, Macon's Corner, Princess Anne Co., *F. & G.*, no. 2829.

D. obtusum (Muhl.) DC. Mixed woods, Virginia Beach, *F. & G.*, no. 2833.

D. strictum DC. Dry pine woods, Cape Henry, *F. & G.*, no. 2825.

D. marilandicum (L.) DC. Mixed woods, Virginia Beach, *F. & G.*, no. 2827.

Stylosanthes biflora (L.) BSP. Dry open woods and thickets: Lynnhaven, no. 3975; Macon's Corner, *F. &. G.*, no. 2835.

S. riparia Kearney. Apparently local: border of dry woods, Little Neck, no. 3976.

Clitoria mariana L. Dry open clay land, Virginia Beach, nos. 3982, 3984.

Some Geographic Varieties of Linum (Plate 396).—*Linum medium*, as currently treated, consists of two strongly defined geographic varieties, differing in several fairly constant, though somewhat confluent characters, as follows.

Leaves elliptic, oval or elliptic-obovate, obtuse or subacute, opaque, without obvious veins shown by transmitted light,

only the uppermost subulate-tipped, 25–40 below the inflorescence: sepals about equaling to shorter than the capsule; the longer 2–3 mm. long; the inner ovate, entire or but sparingly glandular-ciliate: false septa strongly developed, the capsules promptly splitting into 10 valves. . . *L. medium*, var. *typicum.*

Leaves linear or linear-lanceolate to lance-elliptic, subtranslucent, with evident veins shown by transmitted light, all but the lowermost with prolonged subulate tips, 30–150 below the inflorescence: sepals mostly exceeding the capsule; the longer 2.5–5 mm. long; the inner ovate to lanceolate, usually copiously glandular-ciliolate: false septa less regularly developed, the capsules often splitting into only 5 carpels or tardily or incompletely into 10 valves. . . . . Var. *texanum.*

L. medium (Planchon) Britton, var. **typicum.** *L. virginianum*, var. β. *medium* Planchon, Lond. Journ. Bot. vii. 480 (1848). *L. medium* (Planch.) Britton in Britt. & Brown, Ill. Fl. ii. 349 (1897), as to name-bringing synonym, not as to description and figure. *Cathartolinum medium* (Planch.) Small. N. Am. Fl. xxv[1]. 72 (1907), as to name-bringing synonym, not as to description.—Southern Ontario (York Co. to Bruce Co.), northwestern Pennsylvania and northern Ohio. Figs. 1–5.

Var. **texanum** (Planch.), comb. nov. *L. virginianum*, var. δ ? *texanum* Planch. l. c. 481 (1848). *L. virginianum*, γ. *angustifolium* Engelm. in Gray, Pl. Wright. 26 (1852). *L. medium* Britt., l. c. in part (description and fig. 2261). *Cathartolinum medium* Small, l. c. in part (description).—Florida to Texas, north to southwestern Maine, northeastern Massachusetts, southern Vermont, eastern Pennsylvania, West Virginia, southern Michigan, northern Indiana, Illinois, Missouri and Oklahoma. Figs. 6–10.

Linum medium was first recognized by Planchon who treated it, var. *texanum* and *L. floridanum* as varieties of *L. virginianum* L. He correctly understood the latter species, his *L. virginianum*, var. α *microcarpum* being based on the type of *L. virginianum* in the Linnean herbarium. The fruit of the inclusive *L. virginianum* was defined by Planchon with almost complete false septa such as occur in typical *L. virginianum* and in typical *L. medium* ("capsulae parvae depresso-globosae semiseptis fere completis"), while his material of var. *texanum* was immature and Planchon thought that it, as well as *L. floridanum*, might prove to be a distinct species. Planchon's account of the two varieties of *L. virginianum*, here specially significant, was as follows:

Var. β. *medium*,—humilius, ramulis fructiferis strictis erecto-patentibus, calyce capsulam (praecedenti [var. *microcarpum* or typical *L. virginianum*] paulo majorem) paulo superante; fenestra loculorum lineari-angustissima. . . .

Var. δ (?) *Texanum*,—habitu var. α. [*i. e.* elatius, ramulis fructiferis divaricato-patentibus], sed floribus majoribus, laciniis calycinis valde inaequalibus, majore pedicellum brevem et capsulam (non plene maturam) obtusam fere duplo superante. An sp. distincta?

Hab. . . . Var. β, Canada, lacus Huron, *Dr. Todd* in Hb. Hook.; Kentucky, *Dr. Short*, ibid.; alibi verosimiliter in Prov. confederatis.— . . . Var. δ, in ditione Texana, prope S. Felipe, *Drummond*, no. 38. coll. tertiae.

I have not seen the Todd material, which should stand as the type of *Linum medium*, but all other material from southern Ontario, where Todd collected, well matches Planchon's specifications: low, fruiting branches strict, suberect; calyx little exceeding the capsule; and very narrow fenestration of the valves of the fruit. The Ontario plant with these characters comes from shores of Lakes Huron, Ontario and Erie. It ranges from 1.3–4.5 dm. high and has the characters enumerated in the key above.

Fig. 1 shows a characteristic specimen, × ¾ from the Bruce Peninsula, Lake Huron, with enlarged details of the characteristic leaf, calyx, capsule and valves. It is probable that the Kentucky material seen by Planchon was not strictly identical with it.

Linum medium, var. *texanum*, usually taller, with more divergent fruiting branches and with the calyx twice as long as the (young) capsule, was based (as *L. virginianum*, var. *texanum*) on *Drummond*, no. 38 from Texas. An excellent sheet of no. 38, with capsules evidently more mature than in the material seen by Planchon, is in the Gray Herbarium. A small plant from Virginia, closely matching it, is reproduced, × ¾, as fig. 6; and details of leaf, calyx, fruit and valves from it are added. Var. *texanum* may be as low as the average var. *typicum* and its inflorescence may then have short branches. On the whole, however, it is taller, ranging from 1.5–7.5 dm. high, with very many more and narrower, sharp-pointed leaves and elongate branches. As to the septation of the fruit, the 5 carpels in the northern type promptly separate into 10 valves, as Planchon implied and as they usually do in *L. virginianum;* but in the southern variety the carpels are often undivided, though septation occasionally occurs. In this character they show parallelism with the usually non-septate carpels of the southern *L. floridanum* (Planch.) Trel. and their very prompt septation in the more northern and inland *L. intercursum* Bickn. The artist who drew *Linum* for Britton & Brown's Illustrated Flora caught the point: *L. virginianum* (fig. 2260) and *L. striatum* (fig. 2263) showing, correctly, the carpels promptly septate, resulting in 10 valves; *L. floridanum* (fig. 2262) and *L. medium* (var. *texanum*), fig. 2261 (the latter with "leaves . . . lanceolate to linear-lanceolate, acute" and with sepals shown as exceeding the capsule) both correctly illustrated with non-septate valves. But, whereas var.

texanum has carpels and their separated valves barely different from those of typical *L. medium*, *L. intercursum* and *L. floridanum* have marked differences in leaf, fruit and valves, which indicate that they are distinct species; the former of the northern coastal plain, from Massachusetts to Virginia, thence inland and south to western Georgia and northern Alabama; the latter restricted to the southern coastal plain, north to southern Illinois and eastern North Carolina. FIGS. 11–14 show the details of *L. floridanum*, a plant with very numerous (50–150) leaves, the middle and upper (FIG. 11) linear, opaque (FIG. 12) to transmitted light, and with a slender subulate tip 0.5–1 mm. long; capsule (FIG. 13) globose-ovoid and rounded at summit; and individual carpels and valves (FIG. 14) blunt or with short incurved tips. *L. intercursum*, on the other hand, has fewer (15–60) leaves, these (FIG. 15) blunter, showing evident venation (FIG. 16) by transmitted light; the capsules (FIGS. 17 and 18) ovoid and pointed; the individual carpels (FIG. 19) with erect, acuminate beaks.

Linum striatum is separated in our keys by special emphasis on the opposite leaves—"leaves below the branches mostly all opposite" (*Britton & Brown*); "Stem-leaves chiefly opposite" (*Robinson & Fernald*). To the field-botanist who has known the species only on Cape Cod, the islands of southeastern Massachusetts or Block Island, off the coast of Rhode Island, such an emphasis might seem insufficient; he would say: leaves of the stem and of the primary axis of the inflorescence all or nearly all opposite. On the mainland of southern New England, however, more of the leaves are alternate; and southward, through Virginia, the Carolinas and Georgia and westward, many or most of the leaves are alternate. It thus becomes interesting to note Walter's original diagnosis of *L. striatum* of Carolina:

> *striatum* 2. *floribus terminalibus*, foliis subovatis alternis, caule ramosiori *striato* foliorum *nervo marginibusque decurrentibus*.

In general, all the southern material and most of that on the continent northeastward to northeastern Massachusetts and inland to the Great Lakes region has the 5–25 upper leaves of the stem and all or essentially all along the primary axis of the loosely branched inflorescence alternate, only the lower 5–10 (rarely –14) nodes having them opposite, thus sufficiently approximating Walter's diagnosis, "foliis . . . alternis." As already stated, the plant of Cape Cod, Martha's Vineyard, the Elizabeth Islands and Nantucket, Massachusetts and of Block Island, off the coast of Rhode Island, has most of the

leaves (all below the inflorescence and several pairs on the main axis) opposite. Consequently, the lower and often essentially all the branches of the inflorescence are opposite, producing an inflorescence strikingly unlike that of the continental and southern plant, in which they are alternate. The northern insular and peninsular extreme may be called

LINUM STRIATUM Walt., var. **multijugum**, var. nov., foliis caulinis oppositis, foliis ramibusque imis panicularum oppositis.—MASSACHUSETTS: peaty margin of Quanset Pond, Orleans, September 10, 1927, *Fernald*, no. 620 (TYPE in Gray Herb.); moist sandy and peaty shore, second small pond east of Lizzie's Pond, Chatham, *Fernald & Long*, no. 18,663; open mossy bog, Harwich, August 5, 1913, *Weatherby* (slightly transitional); borders of peaty quagmires east of Buck Pond, Harwich, *Fernald & Long*, no. 17,018; near Pleasant Lake, Brewster, August 3, 1911, *E. W. Sinnott;* cranberry bogs near Walker Pond, Brewster, *Fernald*, no. 17,017; dry sandy upper beach of second pond [Seth's P.] north of No Bottom Pond, Brewster, *Fernald & Long*, no. 17,019; damp sandy and peaty beach of Blueberry Pond, Brewster, *Fernald*, in Pl. Exsicc. Gray. no. 371; peaty margin of Sheep Pond, Cuttyhunk, *Fogg*, no. 2528; border of Waquatuquait Pond, Nantucket, September 7, 1885, *Deane.* RHODE ISLAND: various stations on Block Island, August 17, 1892, *J. F. Collins; Fernald & Long*, no. 9770, *Fernald, Hunnewell & Long*, no. 9771; *Fernald, Long & Torrey*, no. 9772; September 28, 1916, *Collins, Spalding & Gravatt;* August 10, 1919, *C. B. Graves.*

Linum virginianum, var. β. *oppositifolium* Engelm. in Gray, Pl. Wright. 26 (1852) was based on typical *L. striatum*, a plant with which Engelmann was otherwise unfamiliar. Exceptional individuals of *L. striatum* from the mainland of southern New England and from Long Island and New Jersey approach var. *multijugum.*

OXALIS FILIPES Small. Frequent in woods and thickets: Great Neck, *F. & G.*, no. 4443; Benefit, *F. & G.*, no. 4444; Knotts' Island, no. 3998.

POLYGALA INCARNATA L. Dry open clay lands and thickets, frequent in Princess Anne Co.; Virginia Beach, no. 4006.

P. MARIANA Mill. Common in dry or moist open soil: Virginia Beach, no. 4005; Little Neck, no. 4004; Blackwater River, no. 4003; Pungo Causeway, *F. & G.*, no. 2846.

P. VERTICILLATA L. Local: dry open clay lands and thickets, Virginia Beach, no. 4001.

CNIDOSCOLUS STIMULOSUS (Michx.) Engelm. & Gray. Sandhills, Cape Henry, no. 4007.

CROTON GLANDULOSUS L., var. SEPTENTRIONALIS Muell. Arg. Dry sand barrens, Cape Henry, *F. & G.*, no. 2847.

Acalypha virginica L. Occasional, in open clay of thickets and fields: Blackwater River, no. 4009.

A. digyneia Raf. Local, in open clay at border of woods, east of Little Creek, no. 4008.

Phyllanthus caroliniensis Walt. Ditch in open clay at border of woods, east of Little Creek, no. 4011.

Ilex vomitoria Ait. Frequent in sandy woods and thickets: Knotts' Island, no. 4021; Creed's, *F. & G.*, no. 4450.

Ceanothus americanus L. Infrequent: dry, mixed woods, Little Neck, no. 4025.

Ampelopsis arborea (L.) Koehne. Local: thickets on sand dunes south of False Cape, no. 4026.

Ascyrum stans Michx. Frequent in borders of woods and clearings: Little Neck, no. 4040; Grassfield, no. 4041.

Hypericum punctatum Lam. Occasional: dry, mixed woods, Little Neck, no. 4038.

We did not see the following, which has been collected in Henry Co.

Hypericum punctatum Lam., var. **pseudomaculatum** (Bush), comb. nov. *H. pseudomaculatum* Bush in Britton, Man. 627 (1901); Britton in Britton & Brown, Ill. Fl. ed. 2, ii. 534, fig. 2894 (1913).

When first published by Dr. Britton, Bush's *Hypericum pseudo maculatum* was cited only from Missouri, and distinguished from *H. punctatum* only by slightly longer petals. In his second publication, however, he separated it also on its acute leaves and more attenuate sepals, and extended its range eastward to Florida and South Carolina. As to length of petal, it is perfectly simple to find in the herbarium sheets of specimens with the upper leaves subdeltoid and acute (*H. pseudomaculatum*) but with petals as small as in the smallest-flowered *H. punctatum*. In fact, the smallest-flowered extreme, *H. micranthum* Choisy, may have the uppermost leaves either rounded at summit, as in typical *H. punctatum*, or deltoid-ovate and acute, as in *H. pseudomaculatum*. Var. *pseudomaculatum*, which is a southern extreme distinguished primarily by having the uppermost and bracteal leaves acute, extends from Florida to Texas, northward to southern Virginia (Martinsville, Henry Co., *Heller*, no. 1095), western Tennessee, Illinois, Missouri and Oklahoma.

H. nudiflorum Michx. Local: shrubs 0.5–0.9 m. high, at border of gum swamp, Oceana, no. 4039.

Apparently the first record from north of North Carolina.

H. gymnanthum Engelm. & Gray. Frequent in damp sands or clays, Princess Anne Co.: Cape Henry, no. 4036; Virginia Beach, no. 4035; Rifle Range, no. 4037.

H. petiolatum Walt. Gum swamps: Oceana, no. 4032; North Landing, no. 4031.

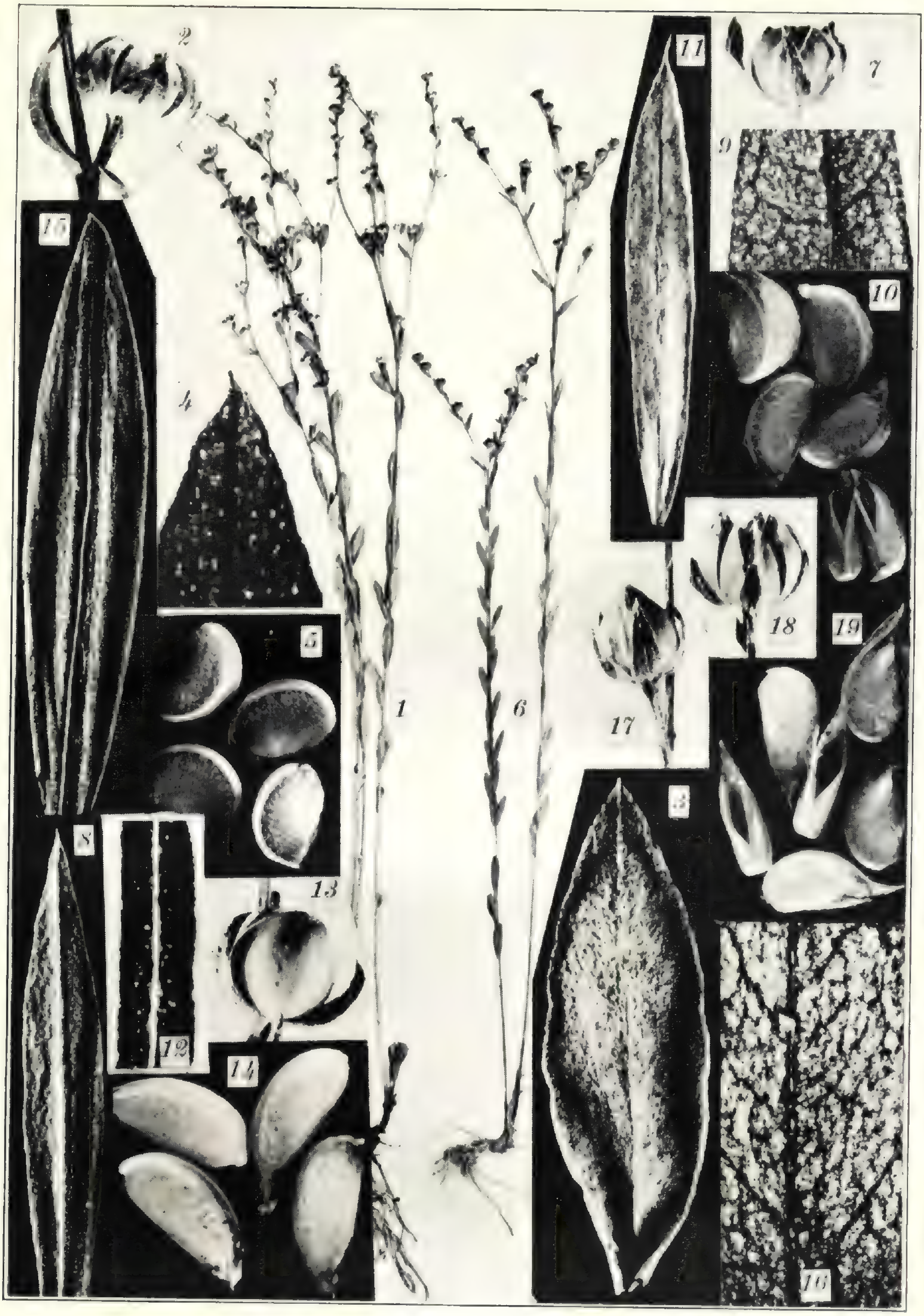


Photo. E. C. Ogden.

LINUM: plants, × ¾; leaves, × 5; details of leaf-venation, × 10; capsules, × 5; ripe carpels, × 8.

L. MEDIUM: FIG. 1, small plant; FIG. 2, capsule; FIG. 3, leaf; FIG. 4, portion of leaf (opaque), by transmitted light; FIG. 5, ripe carpels.

L. MEDIUM, var. TEXANUM: FIG. 6, small plant; FIG. 7, capsule; FIG. 8, leaf; FIG. 9, portion of leaf, by transmitted light; FIG. 10, ripe carpels.

L. FLORIDANUM: FIG. 11, leaf; FIG. 12, portion of leaf (opaque), by transmitted light; FIG. 13, capsule; FIG. 14, ripe carpels.

L. INTERCURSUM: FIG. 15, leaf; FIG. 16, portion of leaf, by transmitteed light; FIGS. 17 and 18, capsules; FIG. 19, ripe carpels.

Photo. E. C. Ogden.

Nyssa sylvatica, var. typica: fig. 1, fruiting branch, × 1; fig. 2, smooth lower surface of leaf, × 10; fig. 3, staminate inflorescence, × 3.

Lechea racemulosa Michx. Occasional: border of woods, east of Little Creek, no. 4049.

Viola affinis LeConte. Dry, mixed woods, Little Neck, no. 4056.

V. sororia Willd. Dry, mixed woods, Little Neck, no. 4055.

V. Brittoniana Pollard. Frequent in swales and damp open soil: Rifle Range, no. 4053, also *F. & G.*, no. 4469; Sand Bridge, *F. G. & L.*, no. 4676; Munden, *F. & G.*, no. 4468; North Landing, *F. & G.*, no. 4467; Blackwater River, no. 4054; Richard Swamp, *F. & G.*, no. 4466.

V. pectinata Bickn. Local: wood-road in pine woods, Dam Neck, no. 4051; damp peat, Rifle Range, *F. & G.*, no. 4463.

Apparently the first record from south of Maryland. Our collections are quite like Bicknell's original material.

Ludwigia glandulosa Walt. Large bushy-branched plants 1 m. high, in gum swamp south of North Landing, no. 4076.

Apparently the first station known north of South Carolina.

L. pilosa Walt. Wet, peaty clearings in woods of *Pinus serotina*, south of Grassfield, no. 4074, there growing with L. linearis Walt. (our no. 4075).

The first evidence, apparently, of *Ludwigia pilosa* from north of South Carolina.

L. brevipes (Long) E. H. Eames, Rhodora, xxxv. 228 (1933) (*Ludwigiantha brevipes* Long). Western Branch of James River, near Portsmouth, August, 1840, *F. Rugel* in Gray Herb.; shallow water, pond along railroad, 37th Street Station, Cape Henry [Virginia Beach], June 26, 1922, *Randolph & Randolph*, no. 331; shallow pools and wet sand of dune-hollows, south of False Cape, Princess Anne Co., no. 4070.

Our station, south of False Cape, is very extensive, within a short distance of the North Carolina line and on one of the outer sand-bar islands which extend to Cape Hatteras and beyond. The species will doubtless be found in North Carolina. The type station, on the New Jersey coast, is the only one known north of Virginia.

Hydrocotyle Canbyi C. & R. Frequent in Princess Anne Co.: silts near outlet of Rainey's Pond, Sand Bridge, no. 4090; damp sand and clay back of the ponds, Dam Neck, no. 4091.

H. ranunculoides L.f. Local: in and by a brook, inundated swale back of the dunes, False Cape, no. 4086.

Cicuta Curtisii C. & R. Gum swamps: Oceana, no. 4083.

Angelica villosa (Walt.) BSP. Border of dry, mixed woods, Little Neck, no. 4082.

Cornus stricta Lam. Swamps and margins of creeks: False Cape, no. 4100; Indian Creek, *F. G. & L.*, no. 4648.

The Varieties of Nyssa sylvatica (Plates 397–400).—In Princess Anne County we were very much perplexed by the genus

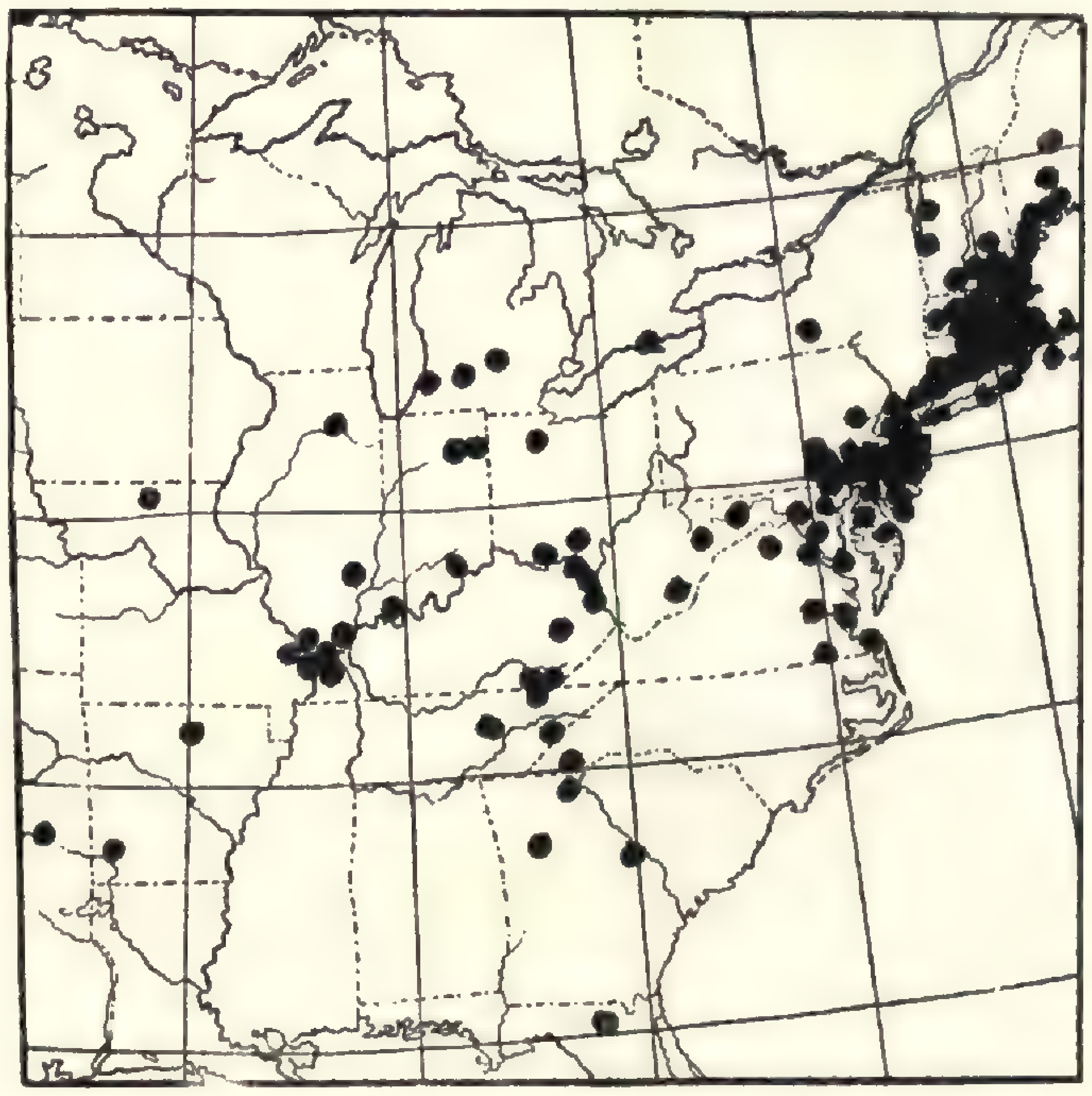
Nyssa. *N. aquatica* L., with its large solitary fruits, was perfectly clear, but the trees with small paired or triple fruits showed such diversity of foliage, two of the extremes often growing within a few miles of each other, that it has seemed important to settle, so far as possible, their identities. Very briefly, I find no very positive differences in flowers and fruits in the series including *N. sylvatica* Marsh. and *N. biflora* Walt. Another of the series, not recently recognized, is *N. caroliniana* Poiret, in which the foliage and fruits are somewhat larger than in the other two, but with so many transitions that I am forced to treat them as well marked varieties. From the description "with oval, or rather inverse egg-shaped leaves" and from the region whence it came (Pennsylvania) *N. sylvatica* Marsh. is clearly the northern extreme, with long fruiting peduncles, short staminate pedicels and elliptic to obovate, abruptly short-pointed and comparatively small leaves smooth beneath. *N. biflora* Walt., from the brief diagnosis "foliis oblongo-lanceolatis integerrimis, laevibus", is safely identified as the narrow-leaved tree with short peduncles already generally understood as *N. biflora*. *N. caroliniana* Poir., with leaves long-tapering to both ends and with long staminate pedicels, I take to be the tree of the series with longest leaves, conforming to the general outline shown in Poiret's illustration. A fourth extreme, somewhat similar to *N. caroliniana*, but with broadly oval to short-oblong leaves, is in some points about as near true *N. sylvatica* but usually with shorter fruiting peduncles and longer staminate pedicels; in other points suggestive of a broad-leaved *N. biflora*. This is distinctly a southern tree and I am unable to identify it with any described form. In order to show the four varieties of *N. sylvatica*, as I view them, it seems desirable that they be illustrated (plates 397–400). The maps of ranges are based on all the material at the Arnold Arboretum and the Gray Herbarium.

The following brief characterizations, with the illustrations, may make my treatment clear.

Nyssa sylvatica Marsh., var. **typica**. *N. sylvatica* Marsh. Arb. Amer. 97 (1785). *N. multiflora* Wang. Nordam. Holz. 46, t. 16, fig. 39 (1787). *N. multiflora*, var. *sylvatica* (Marsh.) Wats. Bibl. Index, 442 (1878).—Leaves adjacent to flowers and fruits (excluding those of vegetative sprouts and leading tips) obovate to elliptic, frequently with short abrupt tip, firm or subcoriaceous, lustrous above, smooth (rarely papillate) and glabrous or glabrate (except sometimes on nerves) beneath, 3–8(–10) cm. long, 2–6 cm. broad: fruiting peduncles (1.5–)3–6.5 cm. long: staminate pedicels 0.5–4 mm. long.—West-central Maine to northern Missouri, south to Virginia and Tennessee

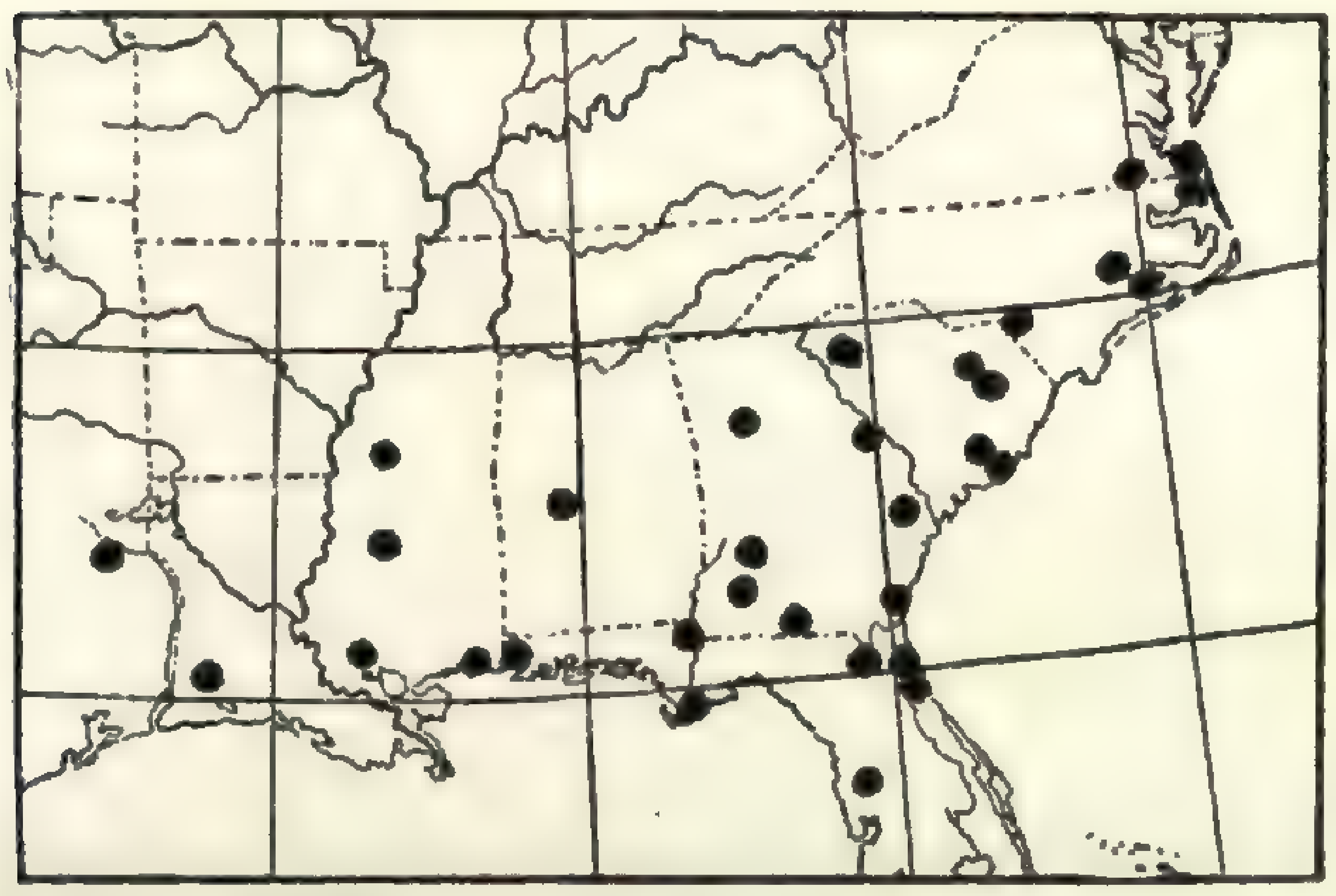
and more locally to northern Florida and northeastern Texas. PLATE 397; MAP 1.

Var. BIFLORA (Walt.) Sarg. Sylva, v. 76, t. ccxviii. (1893). *N. biflora* Walt. Fl. Car. 253 (1788).—Leaves coriaceous, those adjacent to flowers and fruits oblanceolate, narrowly obovate or narrowly oblong-lanceolate, round-tipped, obtuse or subacute, lustrous above, smooth or papillate beneath, 2.5–6(–9) cm. long, 1.5–3.5 cm. broad: fruiting peduncles 1–3.5 cm. long; staminate pedicels 3–5 mm. long.—Coastal plain, southeastern Maryland to Florida, thence to eastern Texas, inland, locally, into the piedmont. PLATE 398; MAP 2.[1]



MAP 1. Range of NYSSA SYLVATICA, var. TYPICA.

Although Sargent in his later work (Manual) and Small maintain *Nyssa biflora* as a species, said to have "Stone prominently ribbed" (*Sargent*) as opposed to "Stone indistinctly ridged" in *N. sylvatica*, I get little distinction; to me they are both furrowed but without any striking difference. When growing in "gum swamps," with abundant water, the bases of the trunks of var. *biflora* are enlarged or swollen, but when growing in damp sands, away from standing water, they do not show this basal enlargement. I am, therefore, in full accord with Sargent's earlier statement, in the Sylva: "This aquatic tree often appears distinct enough from the northern

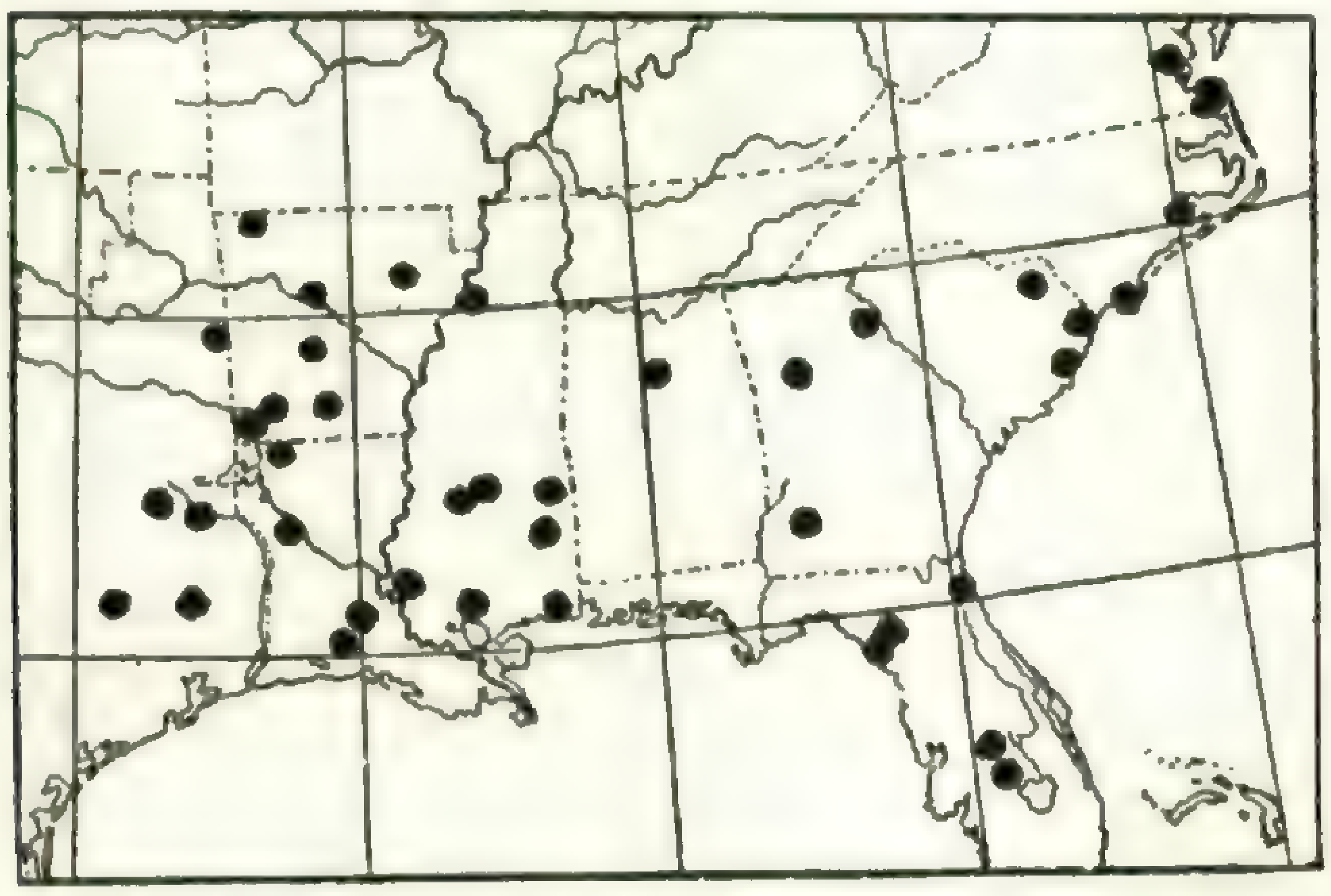


MAP 2. Range of NYSSA SYLVATICA, var. BIFLORA.

[1] The range of var. *biflora* should be indicated as extending northward to southeastern Maryland.

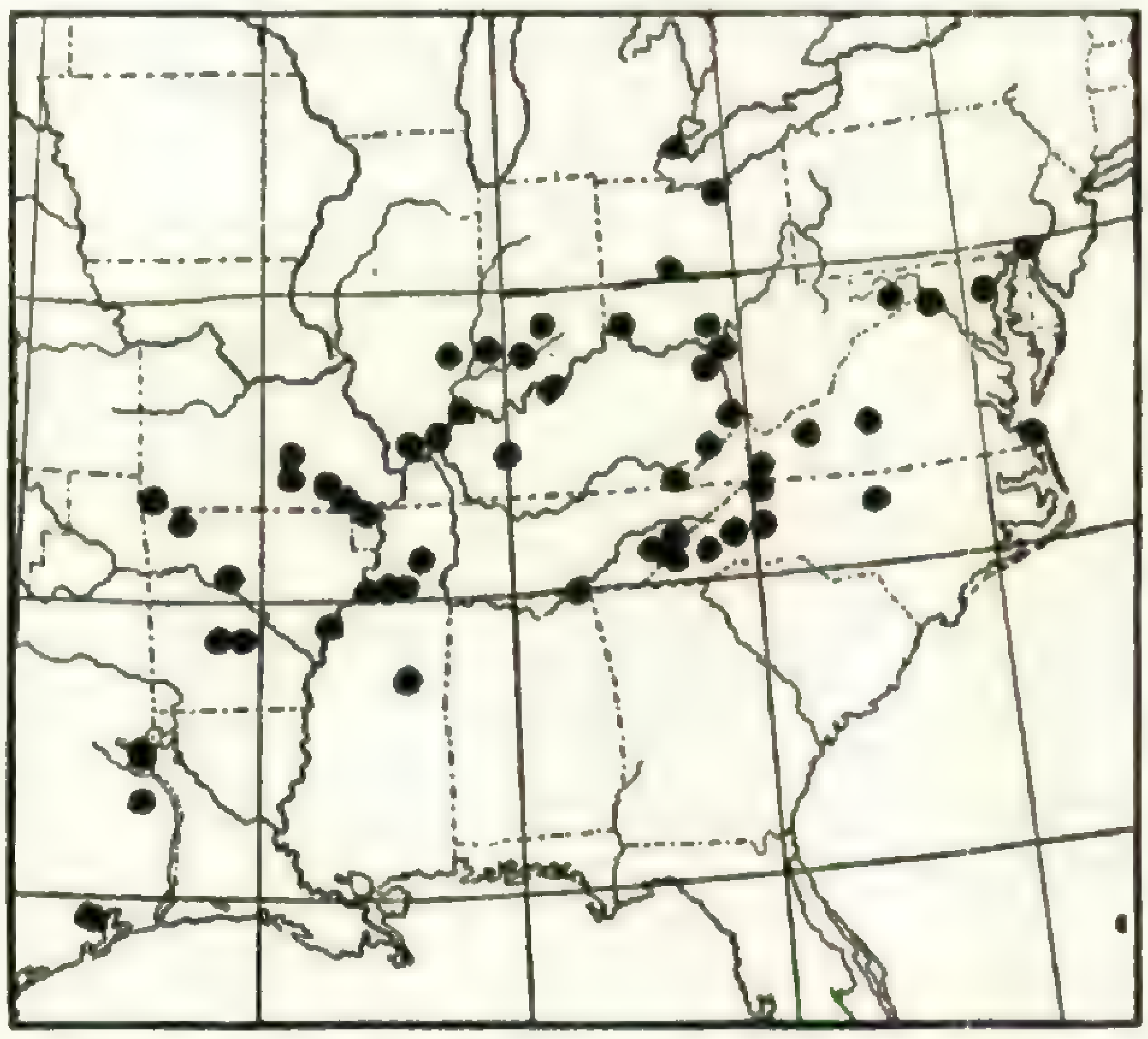
Tupelo, but the extreme forms are connected by others intermediate between the two in the shape and size of their leaves and in the shape and ridges of their stones." Var. *biflora* passes into

Var. **dilatata**, var. nov. (TAB. 399), foliis maturis late ovalibus vel rotundato-oblongis vel late obovatis apice rotundatis subcoriaceis supra lucidis subtus planis vel papillatis pilosis vel glabris; fructi pedunculis 1.5–5 cm. longis; florum staminiorum pedicellis 3–8 mm. longis.—Coastal plain, rarely piedmont, southeastern Virginia to Florida, thence to eastern Texas, eastern Oklahoma and Arkansas. TYPE (PLATE 399): low ground, sandy oak-pine woods, 4 miles southwest of Hartwell, Hart Co., Georgia, August 19, 1927, *Wiegand & Manning*, no. 2339 (Gray Herb.). MAP 3.



MAP 3. Range of NYSSA SYLVATICA, var. DILATATA.

Var. **caroliniana** (Poir.), comb. nov. *N. Caroliniana* Poir. in Lam. Encycl. iv. 507 (1796) and Ill. iii. 442, t. 851, fig. 1 (1823).—Leaves submembranaceous to thin-coriaceous; those adjacent to flowers and fruit rhombic-oval to rhombic-obovate, tapering subequally to the usually acuminate (rarely blunt) base and apex, papillose and frequently pilose beneath, (6–) 8–15 cm. long, 3.5–8 cm. broad: fruiting peduncles 1.5–5 cm. long; pedicels of staminate flowers 2–4.5 mm. long.—Chiefly in the uplands and the interior, Chester County, Pennsylvania to Essex Co., Ontario, thence to southeastern Virginia, interior North Carolina, Tennessee, northern Mississippi and eastern Texas. PLATE 400; MAP 4.



MAP 4. Range of NYSSA SYLVATICA, var. CAROLINIANA.

Photo. E. C. Ogden.

Nyssa sylvatica, var. biflora: fig. 1, fruiting branch, × 1; fig. 2, staminate inflorescence, × 3.

Photo. E. C. Ogden.

NYSSA SYLVATICA, var. DILATATA: FIG. 1, fruiting branch (TYPE), × 1; FIG. 2, staminate inflorescence. × 3.

The dominance of var. *caroliniana* in the Appalachian and Ozark Uplands, whence it spreads locally into the lower levels, is striking. It there reaches higher altitudes than typical *Nyssa sylvatica*, some collections (for example, from Walker Mountain, Smyth Co., Virginia, *Small*) recorded as from 3000 feet, others from "summits" of mountains. Within four miles of the Atlantic, on the outer coastal plain, we found var. *caroliniana* (Oceana, Princess Anne Co., no. 4097) associated with other inland types (*Asimina triloba, Morus rubra, Ulmus americana, Carex virescens,* etc.) and only a short distance from colonies of *Thelypteris hexagonoptera, Liparis liliifolia, Liriodendron Tulipifera, Oxydendrum arboreum* and other Alleghenian types. Within an equally short distance were the coastal plain *N. sylvatica*, var. *biflora* and hundreds of other southern coastal plain types.

I am placing the Alleghenian tree with *Nyssa caroliniana* Poir. on account of Poiret's figure, which seems to represent this variety. His description called for "feuilles . . . ovales, . . . aiguës à leurs deux extremités, . . . glabres des deux côtés . . . Cet arbre crôit naturellement dans la Virginie & la Caroline." At the same time Poiret published *N. canadensis:* "Cette espèce a beaucoup de rapports avec le précédente, peut-être même n'en est-elle qu'une variété, quoique d'un pays différent. C'est le même port, la meme disposition dans les feuilles & les fleurs; cependant les feuilles, au lieu d'etre glabres, sont fortement velues en-dessous sur leurs principales nervures, & ciliées à leur circonference . . . Cette plante a été envoyée du Canada au citoyen Lamarck." Without seeing Poiret's type it is not possible to say whether he had var. *caroliniana* or var. *typica*, both of which extend into southernmost Canada.

VACCINIUM MACROCARPON Ait. Swampy or inundated woods, north of Blackwater River, Princess Anne Co., no. 4123.

It was certainly surprising to find the cranberry on the coastal plain within 10 miles of North Carolina. The species has been known southward to the mountains of North Carolina and Kearney found it at Virginia Beach; but at our station in Princess Anne Co. it was growing beneath *Cladium jamiacensis* and *Smilax laurifolia* and associated with many other southern, rather than northern types.

LYSIMACHIA QUADRIFOLIA L. Occasional in woods: Virginia Beach, no. 4125.

POLYPREMUM PROCUMBENS L. Occasional in damp sand or clay: Cape Henry, no. 4130; North Landing, *F. & G.*, no. 2875.

SABATIA BRACHIATA Ell. Local: dry, mixed woods, Little Neck, no. 4134.

An extension north from North Carolina.

S. angularis (L.) Pursh. Frequent in woods, thickets and clearings, very showy in late July and early August: Virginia Beach, no. 4132.

S. gracilis (Michx.) Salisb. Swales back of the dunes, Rifle Range, south of Rudy Inlet, no. 4133.

As pointed out in Rhodora, xxxiv, 27, *Sabatia gracilis* is a southern species, heretofore known north to eastern North Carolina. It is quite distinct from the inland and northern *S. campanulata* (L.) Torr., with which it has been confused.

Bartonia virginica (L.) BSP. Apparently local: damp sandy and peaty depressions back of the dunes, Rifle Range, no. 4136.

Gentiana parvifolia (Chapm.) Britton. Local: with the last, no. 4135.

Asclepias tuberosa L. Common, very conspicuous in June, in clearings and open areas: Creed's, no. 4139. Forma flavescens Farwell. Local: Blackwater River, no. 4140.

Asclepias lanceolata Walt., var. **paupercula** (Michx.), comb. nov. *A. paupercula* Michx. Fl. Bor.-Am. i. 108 (1803).

Assuming that Walter's *Asclepias lanceolata* is the plant with the median leaves lanceolate (Walter's types are so fragmentary that the lower and middle portions of large plants are rarely preserved), the plant of Princess Anne and Norfolk Counties is chiefly var. *paupercula*, which has all the leaves very narrowly elongate-linear ("foliis longissime linearibus"—*Michx.*). We collected the lanceolate-leaved *A. lanceolata* in the brackish marsh of Back Bay, east of Morse Point in Currituck Co., North Carolina (no. 4142). Typical *A. lanceolata* extends north to New Jersey and south to Florida. Most specimens before me do not specify the habitat. One from Miami, Florida (*Garber*) is from "Everglades," one from near Elizabeth City, North Carolina (*Biltmore Herb.*, no. 1415[c]) is said to be from "Wet pine barrens;" Wiegand & Manning's no. 2596 is from "River swamp" west of Leechville, North Carolina, which is on the estuary of Pungo River; our collection (see above) is from border of salt marsh; and Stone thus summarized the situation in New Jersey: "Though said in the books to be a plant of 'wet pine barrens' it is, so far as New Jersey is concerned, strictly confined to the edge of the salt marshes, where they join the upland" (Stone, Pl. So. N. J. 650 (1911)). May not the difference in habitat be largely associated with the breadth of leaf?

Our three collections of var. *paupercula* are all from acid peat: swales back of the dunes, Rifle Range, south of Rudy Inlet, Princess Anne Co., no. 4141; wet peaty clearings in woods of *Pinus serotina*,

south of Grassfield, Norfolk Co., no. 4143; boggy swale by Northwest River, Northwest, *F. G. & L.*, no. 4691 (transitional). There is an old specimen of it in the Gray Herbarium from Norfolk (*J. D. Dana*). As represented in the Gray Herbarium, var. *paupercula* reaches its northern limit in southeastern Virginia; we have it from South Carolina and Georgia ("moist pine-barrens," Sumter Co., *Harper*, no. 1041), with many sheets from Florida, thence to southeastern Texas. Only a few specimens from Florida show indication of habitat and those from Mississippi, Louisiana and Texas give no such data. The Florida specimens which give clues to habitat are from Lake Co., near the geographic center of the state; from "swaley woods," Waldo (in the interior); "around ponds," Myers; "pond-margin," Chipley; "cypress swamp," Fort Myers; "swampy pine barrens," near Jacksonville. It is reasonably clear, then, that typical *A. lanceolata* prefers brackish to saline habitats, var. *paupercula* those which are acid.

A. VERTICILLATA L. Local: dry, mixed woods, Little Neck, no. 4144.

DICHONDRA REPENS Forst., var. CAROLINIENSIS (Michx.) Choisy. Frequent in grasslands: open clay at border of woods, east of Little Neck, no. 4146.

CONVOLVULUS SEPIUM L., var. **Catesbeianus** (Pursh), comb. nov. *Calystegia Catesbeiana* Pursh, Fl. Am. Sept. ii. 729 (1814). VIRGINIA: thickets and woods, Dam Neck, Princess Anne Co., no. 4147.

Var. *Catesbeianus* is the coastal variety (Cape Cod to Florida) with narrowly oblong to lanceolate, long-acuminate, sagittate leaves. It may be pubescent or glabrate and sometimes quite glabrous. Its very narrow and long-acuminate leaves at once distinguish it from var. *pubescens* (Gray) Fern. and from var. *americanus* Sims (the common American plant with glabrous stems and leaves and roseate flowers).

CUSCUTA POLYGONORUM Engelm. On *Cassia*, border of pines, near Princess Anne Courthouse, *F. & G.*, no. 2879.

C. CORYLI Englem. On various herbs, damp woods, Virginia Beach, no. 4149.

HELIOTROPIUM CURASSAVICUM L. Brackish places: Wachapreague, no. 4151; Kempsville, *F. & G.*, no. 2880.

LIPPIA NODIFLORA (L.) Michx. Brackish to fresh sands and ditches by Back Bay, northern end of Knott's Island, no. 4154.

SCUTELLARIA OVALIFOLIA Pers. Dry, mixed woods, seen several times: Little Neck, Princess Anne Co., no. 4160.

Primarily a species (*S. pilosa* Michx., not Hill) of the richer interior, on Little Neck, Great Neck and neighboring areas of rich woodland forming one of an assemblage of isolated piedmont species.

Pycnanthemum incanum Michx., var. **Loomisii** (Nutt.), comb. nov. *P. Loomisii* Nutt. in Journ. Acad. Sci. Nat. Philad. vii. 100 (1834). Virginia: Emporia, Greenville Co., *Tidestrom*, no. 6887; border of wet woods near Great Bridge, Norfolk Co., no. 4162.

Var. *Loomisii* is the southern extreme of *Pycnanthemum incanum* with the pubescence of branches and bracts reduced to a mere white-pruinose or white-puberulent coat, whereas typical *P. incanum* has the branches and, more or less, the bracts short-villous or pilose. Var. *Loomisii* has the pubescence of *P. albescens* Torr. & Gray and closely resembles that species but its calyx-lobes are sharp and setose, those of *P. albescens* blunt and without setae. Var. *Loomisii* is in the Gray Herbarium from New Jersey, Delaware, Virginia, North and South Carolina, Georgia and Alabama.

Physalis pubescens L. Infrequent in dry, sandy woods: Knott's Island, no. 4167; Sand Bridge, no. 4168.

Tentatively placed here; the entire group needs intelligent checking with the types.

Petunia parviflora Juss. Brackish sand, upper border of salt marsh, Wachapreague, Accomac Co., no. 4169.

Apparently indigenous, possibly adventive; an extension northward of the natural range, from Florida.

Mimulus alatus Ait. Occasional in swampy woods: Munden, no. 4186.

Limosella subulata Ives. Wet sand of dune-hollows, south of False Cape, Princess Anne Co., no. 4180.

Apparently the first recorded station south of New Jersey, southeastern Pennsylvania and the head of Chesapeake Bay in Maryland. The station is so close to the North Carolina line that search will doubtless extend the species into the "southern flora."

Bacopa Monnieria (L.) Wettst., var. **cuneifolia** (Michx.), comb. nov. (plate 401, figs. 1–4 and 7). *Moniera cuneifolia* Michx. Fl. Bor.-Am. ii. 22 (1803). Virginia: damp sand and clay back of the ponds, Dam Neck, Princess Anne Co., no. 4183; wet sand of dune-hollows, south of False Cape, Princess Anne Co., no. 4184 (prostrate and repent); inundated swales back of the dunes, south of False Cape, no. 4185 (erect or sub-erect, up to 3 dm. high).

Typical *Bacopa Monnieria*[1] of pantropical range is smaller (figs. 5

[1] I am spelling the specific name *Monnieria*, not *monnieri*, since the evidence indicates that the latter spelling, though originally used by Linnaeus, was a typographic or orthographic error. As a specific name it started in one of the Linnean Dissertations as LYSIMACHIA (*monnieri*), Cent. II. Pl. 9 (1756). These dissertations were edited, slightly revised and reprinted in Amoenitates Academicae. Centuria II, Plantarum was no. lxiii in Amoen. Acad. iv. pp. 297–332, and there the plant under discussion appeared as GRATIOLA (*monnieria*), with some alterations in the

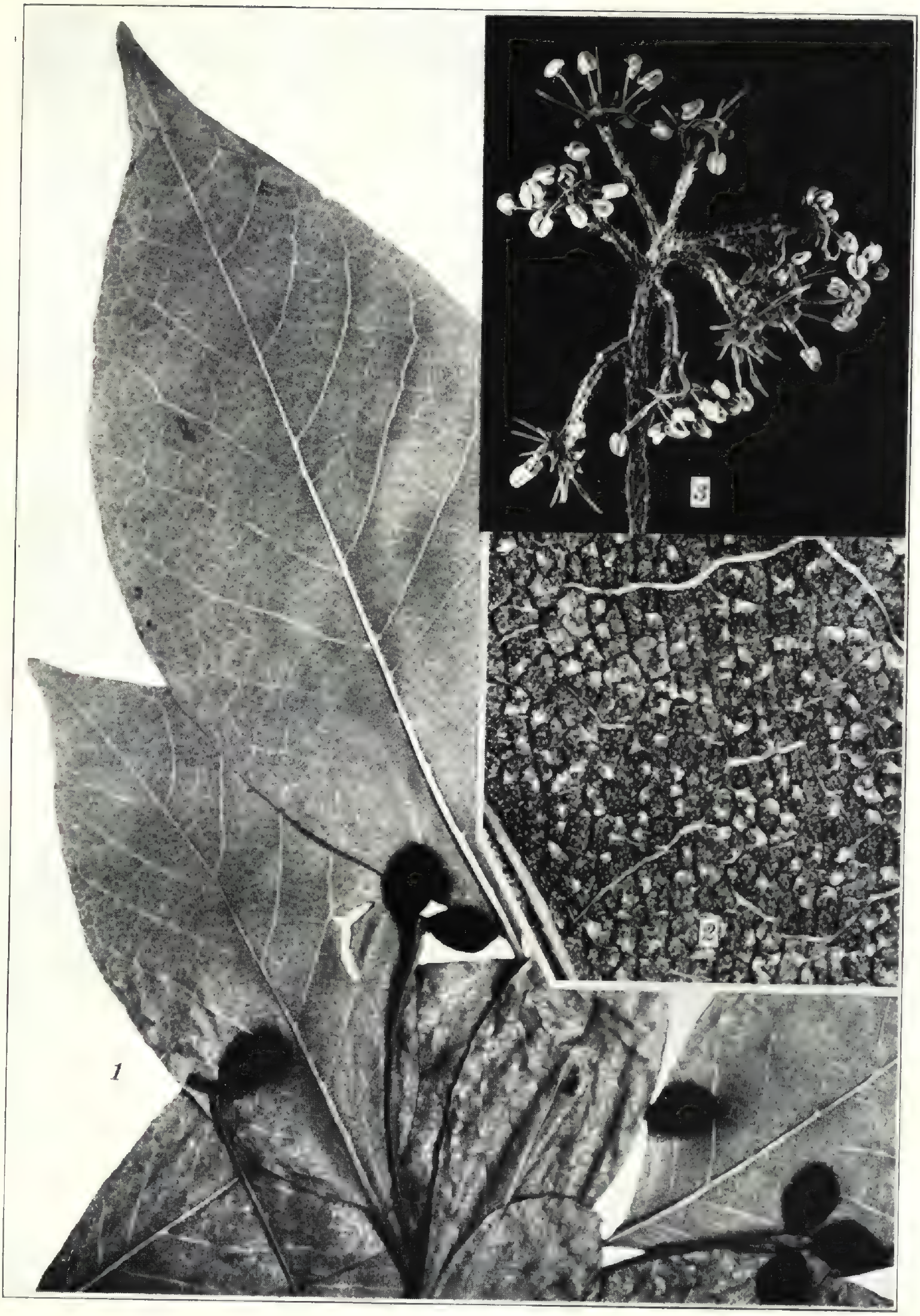


Photo. E. C. Ogden

NYSSA SYLVATICA, var. CAROLINIANA: FIG. 1, fruiting branch, × 1; FIG. 2, papillate lower surface of leaf, × 10; FIG. 3, staminate inflorescence, × 3.

Photo. E. C. Ogden.

Bacopa Monnieria, var. cuneifolia: figs. 1 and 2, summits of erect plants, × 1; figs. 3 and 4, flowers, × 3; fig. 7, terminal leaves, × 3.
B. Monnieria: fig. 5, plant, × 1; fig. 6, fruit.

and 6), forming close carpets, the larger sepals lanceolate to lance-ovate and 1.5–2.5 mm. wide. Var. *cuneifolia*, originally from South Carolina, is typical on the coast from Georgia to southeastern Virginia, also Bermuda, and locally in the West Indies, extending thence west to Texas; it also occurs in Hawaii. It is the coarsest extreme of the species, the larger sepals ovate and 3–5 mm. broad.

It seems to me wiser to retain *Bacopa* Aublet (a *nomen conservandum*) for *Moniera* P. Br. or *Herpestis* Gaertn. f. in the inclusive sense of Bentham, Gray, Wettstein, Chodat, Edwall, Standley and others, rather than to follow Pennell in recognizing the sections and subsections as "genera." *Bacopa Monnieria* belongs to Bentham's (and Gray's) *Herpestis* § *Bramia*, to Wettstein's *Bacopa* § *Bramia*. Treated by Pennell[1] as a genus, with the floral characters already well known to Bentham, Gray and Wettstein and evaluated by them as sectional only, *Bramia* is further defined by Pennell with minor vegetative characters which are certainly not generically diagnostic: "Extensively repent" (clearly not in FIGS. 1 and 2); "Stem glabrous" (surely not a character of profound phylogenetic importance); "leaves spatulate-oblong, with one evident longitudinal nerve" (but deep in the tissue of the fleshy—halophytic—leaf there may be additional nerves), "Sepals acute or acutish, much exceeding the acute capsule" as opposed to "Sepals obtuse, scarcely longer than the rounded capsule" in *Ranapalus* or *Bacopa rotundifolia* (Michx.) Wettst. *Bacopa Monnieria* var. *cuneifolia*, included by Pennell under *Bramia* with "Sepals acute or acutish" may have them decidedly obtuse, as in FIGS. 3 and 4. *Bramia* and *Ranapalus* come in Pennell's treatment under a division including "Leaves . . . very entire," as opposed to "Leaves . . . crenate." If *entire* is an adjective which may have varying

citations. Subsequently, in Species Plantarum, ed. 2, i. 24 (1762), it appeared as *G. Monnieria*, and this spelling and capitalization were maintained by Linnaeus in Species Plantarum, ed. 3 (1764) and in his Systema Naturae, ed. 13, ii. 61 (1770). The same spelling (*Monnieria*) was maintained by Murray, Willdenow and other editors of the Linnean works. In Syst. Nat. ed. 10, ii. 851 (1758–59) it appeared as *G. Monnieri. A.*; and this spelling reappeared in ed. 11 (1760); it seems to to have been omitted from ed. 12, but in ed. 13, as already noted, it was *G. Monnieria*. Richter, in his monumental Codex Botanicus Linnaeanus, maintained *G. Monnieria* and specially designated the spelling *Monnieri* as a typographical error ("Gr. Monnieri, *ex err. typ.*"). It should be clear that, although bungling the name (which had been a generic name of Patrick Browne), Linnaeus, in his more mature and careful work (Syst. ed. 10 being in many ways carelessly edited) settled upon *Monnieria* as the preferred spelling; and since his later editors and commentators also adopted this spelling and looked upon *monnieri* and *Monnieri* as typographic errors, it is better so to consider them. I am indebted to Dr. Barnhart for his kindness in sending me transcripts from the original Dissertation, Cent. II. Plantarum.

[1] Pennell, *Scrophulariaceae of the Southeastern United States*, Contrib. N. Y. Bot. Gard. no. 221, Proc. Acad. Nat. Sci. Phila. lxxi. 228, 229 (1920).

degrees, "very" entire is an unfortunate description of leaves which may often be like those shown in FIG. 7 (from *Harper*, no. 1826, specially designated in the Gray Herbarium by Pennell as *Bramia*).[1]

Bacopa acuminata (Walt.) Robinson. Occasional in depressions and damp sands: Rosemont, no. 4181; Rifle Range, no. 4182.

Gratiola pilosa Michx. Frequent in depressions, damp sands and swales: Rosemont, no. 4173; Rifle Range, nos. 4174, 4175; False Cape, no. 4172.

Utricularia geminiscapa Benj. Shallow pools in pinelands, Cape Henry, no. 4187.

U. subulata L. Damp sands and peats, Princess Anne Co.: Cape Henry, no. 4188, also *F. & G.*, no. 4502.

Phryma Leptostachya L., var. **confertifolia**, var. nov. (TAB. 402, FIG. 1), internodiis plerumque abbreviatis 0.4–1.5 cm. longis valde cinereo-pilosis; foliis subgriseis subtus puberulis apice vix prolongatis dentibus marginalibus simplicibus crenatis brevibus.—Virginia: dry, mixed woods, Little Neck, Princess Anne Co., August 8 and 9, 1924, *Fernald & Long*, no. 4197 (TYPE in Gray Herb.); rich, deciduous woods, east of Little Creek, Princess Anne Co., July 31, 1934, no. 4196.

Typical *Phryma Leptostachya* has the internodes elongate, the pairs of leaves standing distinctly apart, the stems less pubescent, the leaves (FIG. 2) bright-green and only sparingly pubescent, their tips sharply acuminate or prolonged, and their usually double marginal teeth much prolonged. Var. *confertifolia*, on account of the shortening of the internodes, gives the appearance of having the bluntish or

[1] Restoring the material of *Bacopa* in the Gray Herbarium to that genus, I find it necessary to make the following combinations:

Bacopa acuminata (Walt.) Rob., var. **microphylla** (Raf.), comb. nov. *Ambulia rigida* Raf., var. *microphylla* Raf. Aut. Bot. 43 (1840). *Mecardonia acuminata brevifolia* Pennell, Proc. Acad. Nat. Sci. Phila. lxxi. 237 (1920). *M. acuminata microphylla* (Raf.) Pennell, Torreya, xxii. 79 (1922).

B. acuminata (Walt.) Rob., var. **peninsularis** (Pennell), comb. nov. *Mecardonia acuminata peninsularis* Pennell, Proc. Acad. Nat. Sci. Phila. lxxi. 237 (1920).

In 1930 Pennell marked the material in the Gray Herbarium *Mecardonia acuminata peninsularis;* in 1931 he assigned it to the genus *Pagesia*, but he left typical *Bacopa acuminata* and var. *microphylla* in the genus *Mecardonia*.

B. procumbens (Mill.) Greenm., var. **peduncularis** (Benth.), comb. nov. *Herpestis peduncularis* Benth. in Hook. Comp. Bot. Mag. ii. 56 (1836). *H. chamaedryoides*, var. *peduncularis* (Benth.) Gray, Syn. Fl. N. Am. ii[1]. 280 (1878). *Mecardonia peduncularis* (Benth.) Small, Fl. Se. U. S. 1065, 1338 (1903).

B. procumbens (Mill.) Greenm., var. **tenuis** (Small), comb. nov. *Mecardonia tenuis* Small, Fl. Se. U. S. 1065, 1338 (1903).

Although Pennell maintained this as a species he characterized *Mecardonia tenuis* as "so close to *M. procumbens* and to *M. peduncularis* (Benth.) Small of Texas that the actual relationship of these species should be more fully investigated in the field" (Proc. Acad. Nat. Sci. Phila. lxxi. 238 (1920)). Asa Gray better understood it (Syn. Fl.) when he said of it under *Herpestis procumbens*, var. *peduncularis:* "A similar form, but with diffuse or procumbent stems (*H. peduncularis*, Chapm. Fl. 291), is from Key West, Florida."

merely acute gray-green leaves subverticillate. No typical *P. Leptostachya* was seen on the coastal plain of Virginia.

GALIUM OBTUSUM Big., var. **filifolium** (Wiegand), comb. nov. *G. tinctorium filifolium* Wiegand in Bull. Torr. Bot. Cl. xxiv. 397 (1897). *G. filifolium* (Wiegand) Small, Man. 1208 (1933).—Frequent in damp woods about Virginia Beach, no. 4202, also *F. G. & L.*, no. 4704.

In his very helpful study[1] of *Galium trifidum and its North American Allies*, Wiegand clearly differentiated several plants which had previously been confused under *G. trifidum;* but, although he said of *G. trifidum*, as well as of some of the other names involved, "It is necessary first of all to determine just what plant this name represents," he contented himself with a discussion of the interpretations of various post-Linnean authors, without recording any effort to see exactly what Linnaeus had before him. In the cases of *G. trifidum* L. Sp. Pl. 105 (1753) and *G. tinctorium* L. l. c. 106 (1753) the types are perfectly clear; both were collected by Kalm, the first in "Canada," the second in "North America." Happily, Wiegand's deduction regarding the identity of *G. trifidum* was correct; a beautiful photograph of the Kalm sheet (the type) sent me from the Linnean Herbarium by Mr. S. Savage is a most characteristic specimen of the plant, with long arcuate peduncles, now properly passing as *G. trifidum.*

In the other case, however, that of *Galium tinctorium*, I am unable to follow Wiegand's reasoning when he writes of it, "From the description given by Linnaeus one can scarcely tell which plant is meant," for to me the Linnean diagnosis of Kalm's specimen (from Eastern America, probably Crown Point, New York, at the foot of Lake Champlain) is definite: "foliis linearibus: caulinis senis; ramorum quaternis, caule flaccido, pedunculis subbifloris, fructibus glabris." In spite of the clear statement by Linnaeus that the linear cauline leaves were in 6's, those of the branches in 4's, and the stems flaccid, Wiegand applied the name *G. tinctorium* to *G. obtusum* Bigelow and defined it as "rather stiff, . . . branches . . . strict, . . stem glabrous or nearly so; leaves commonly in 4's, . . . corolla white, large (2–3½ mm. diam.), 4-parted"; while he called the small-flowered and weaker plant with primary leaves in 6's *G. Claytoni* Michx., well characterized by Wiegand: "stem slender . . . [with] diffuse branches . . . ; leaves . . . commonly in 5's or 6's, . . . flowers in clusters of 2's or 3's, . . . corolla minute, white, 3-parted."

[1] Wiegand, Bull. Torr. Bot. Cl. xxiv. 389–403 (1897).

As a synonym of his *Galium Claytoni* Wiegand cited "*G. tinctorium* Bigelow, Fl. Bost. ed. **2**, 54. 1824." Having learned to have a keen respect for the precision of Jacob Bigelow, who with John Torrey early shared distinction as an accurate American phytographer, I have turned to Bigelow's accounts. After giving a clear English version of the Linnean diagnosis of *G. tinctorium* Bigelow added his own:

> A weak, branching plant, rough with reflexed prickles. Leaves linear-lanceolate, obtuse, whorled, the larger ones in sixes, smaller ones in fours. Peduncles very small, supporting minute white flowers.

Bigelow's account was so like the Linnean diagnosis of *Galium tinctorium* that it is not easy to see why his plant should be treated as identical with *G. Claytoni* Michx., if the Kalm plant (type of *G. tinctorium*) is not also *G. Claytoni*. That Bigelow clearly understood the two species, subsequently again differentiated by Wiegand, is evident. His *Galium obtusum* was thus defined:

> *G. caule laevi, procumbente; foliis quaternis, oblanceolatis, obtusis, margine nervoque asprellis; fructu laevi.*
>
> Stem smooth, procumbent; leaves in fours, oblanceolate, obtuse, rough on the edge and midrib; fruit smooth.
>
> Stem slender, diffuse, much branched, quadrangular, entirely smooth. Leaves universally in fours, linear-lanceolate, very obtuse, a little rough at the midrib and margin. Peduncles slender, three flowered. Petals acute, white. Fruit globular, smooth.—On the banks of Muddy brook, Roxbury.—July.—Perennial.

Further indicating his correct understanding of the two species, Bigelow added the comparative note: "It is a larger and more open plant than G. tinctorium." Every one who knows the type-region of *G. obtusum* and the abundant specimens from there in the local herbaria will agree with Wiegand that the plant which, in 1897, he called *G. tinctorium* is unquestionably *G. obtusum* Bigel.

Since American botanists have been following Wiegand in treating the partly 6-leaved flaccid *G. tinctorium* of Linnaeus as a stiffer plant with "leaves commonly in 4's," it seemed important to settle the exact identity of Kalm's material which is the type of *G. tinctorium*. Fortunately, the sheet in the Linnean Herbarium is well preserved (obviously not much studied in the past!) and a portion of the photograph of it, which Mr. Savage sends, is here reproduced, life-size, as PLATE 403, FIG. 1. Beside it, for comparison, is a portion of a plant (FIG. 2) farther advanced but still with some ascending flowers (the specimen from Conquest, New York, *Wiegand*, no. 7172) of the plant which Wiegand has removed from his own *G. tinctorium* and called *G. Claytoni*. Further to clarify the situation, FIG. 3 is a flowering frag-

Photo. E. C. Ogden.

PHRYMA LEPTOSTACHYA, var. CONFERTIFOLIA: FIG. 1, plant (TYPE), × 1.
P. LEPTOSTACHYA: FIG. 2, characteristic leaf, × 1.

Photo. E. C. Ogden.

GALIUM TINCTORIUM: FIG. 1, portion of TYPE in Linnean Herbarium, × 1, from photograph supplied by Mr. S. SAVAGE; FIG. 2, flowering branch, × 1, of *G. Claytoni*.
G. OBTUSUM: FIG. 3, flowering branch, × 1.

ment, × 1, of the 4-leaved plant which Wiegand thought was meant as *G. tinctorium* by Linnaeus, the plant which had been properly separated from true *G. tinctorium* by Bigelow as *G. obtusum.*

That *G. tinctorium* L. is the small-flowered plant with leaves often in 6's, as originally described, seems perfectly clear; and that it is also *G. Claytoni* Michx. is sufficiently demonstrated by a fragment of Michaux's type long ago presented to Asa Gray and now preserved in the Gray Herbarium.

I have suggested that the type of *Galium tinctorium* came from Crown Point on Lake Champlain. Linnaeus had his material from Pehr Kalm who, on July 8, 1749, wrote of it from "Fort St. Frederic, welches von den Engländern Crownpoint genannt wird":

> *Vom achten.* Das *zum Färben dienliche Meyerkraut** wurde in dem ganzen Canada von den Franzosen *Tisavojaune rouge* genannt, und wuchs hier in Menge in den Wäldern, und liebte eine gute Gartenerde, die fast etwas feuchte war. Mit den Wurzeln hiervon gaben die Wilden den Stacheln der Amerikanischen Igeln [quills of the American porcupine], welche sie in verschiedene Arbeiten einflechten, die rothe Farbe; und wird dieselbe schwerlich von der Sonne, dem Wasser oder der Luft verandert. Die Französischen Frauensleute in Canada sollen auch ihre Kleider mit diesen Wurzeln, welche klein, als bey dem gelben *Meyerkraute* (*Galium luteum*) sind, roth färben.—Kalm, Reise, iii. 303, 304 (1764).
>
> *Galium (tinctorium) foliis linearibus, caulinis senis . . . *Linn. Sp. pl.* 106.

If any further evidence were needed as to what Kalm (and after him Linnaeus) meant it could be found in Kalm's statement that his *Galium tinctorium* grew in all of Canada (in dem ganzen Canada), for the tiny-flowered plant with the leaves of the primary axes usually in 6's is superabundant in the Province of Quebec (Canada of Kalm); the stiffer plant with larger leaves in 4's and with large flowers is very local in Quebec, found only in the southwest corner of the Province. In the Gray Herbarium there are 10 sheets of true *G. tinctorium* (*G. Claytoni*) from the portion of Canada known to Kalm; but the two sheets of *G. obtusum* from the Province are both from the vicinity of Montreal.

N. B. The above and other similar cases emphasize the absolute necessity of getting back to the actual types when possible.

Galium triflorum Michx., var. **asprelliforme**, var. nov. (tab. 404, fig. 1), inflorescentia paniculata laxe ovoidea vel ellipsoidea foliorum verticellis superioribus valde reductis, ramis floriferis elongatis paniculato-ramosis plerumque 3–8-nodatis foliis 3–10 mm. longis.—Southern and western New England and New York to northern Florida and Tennessee. Type: border of wet woods near Great

Bridge, Norfolk Co., Virginia, August 4 and 5, 1934, *Fernald & Long*, no. 4205 (in Gray Herb.).

Typical *Galium triflorum* Michx. "pedunculis lateralibus et terminalibus verticillato longioribus, trifloris," originally from "umbrosis Canadae sylvis," occurs in southern Greenland and generally from Newfoundland to southern Alaska, southward into the wooded areas of the northern United States, thence to the uplands of Virginia and sparingly Tennessee, northern Louisiana, Texas and Mexico; it is also in northern and mountainous areas of Eurasia in quite typical form (fig. 2), with the upper leaves but slightly reduced and the peduncles short and terminally 3-flowered or 3-forked. In southern and western New England and in southern and central New York var. *asprelliforme* is occasionally found, especially in warm areas, and southward it largely takes the place of the typical northern plant. All the material in the Gray Herbarium from Florida, the Carolinas and the coastal plain of Virginia belongs to var. *asprelliforme;* and most of that from Tennessee and Kentucky is either the variety or strongly transitional to it. The name is selected because, in the herbarium, the variety has been repeatedly placed under *G. asprellum* Michx.

G. uniflorum Michx. Occasional: rich deciduous woods, east of Little Creek, Princess Anne Co., no. 4207; Great Neck, *F. G. & L.*, no. 4702; Sigma, *F. G. & L.*, no. 4703.

The first from north of South Carolina.

Viburnum scabrellum (T. & G.) Chapm. Border of oak woods, north of Seatack, no. 4212.

Melothria pendula L. Wet sandy woods, northern end of Knott's Island, Princess Anne Co., no. 4213; and seen, occasionally, at other places.

Lobelia Nuttallii R. & S. Local: damp sandy and peaty depressions back of the dunes, Rifle Range, no. 4214.

Vernonia glauca (L.) Willd. Rich deciduous woods, east of Little Creek, no. 4215; and seen elsewhere in northern Princess Anne Co.

A species of the rich interior, apparently isolated and very unusual on the coastal plain.

Eupatorium cuneifolium Willd. Wet, peaty clearings in woods of *Pinus serotina,* south of Grassfield, Norfolk Co., no. 4223.

Apparently an extension north from South Carolina; var. *semiserratum* (DC.) Fern. & Grisc. is frequent or common.

Mikania scandens (L.) Willd., var. pubescens (Muhl.) T. & G. Inundated swale back of the dunes, south of False Cape, Princess

Anne Co., no. 4229; seen in abundance on the brackish to salt marshes along the causeway leading from Munden to Knott's Island.

In Princess Anne Co., *Mikania scandens* of fresh marshes and thickets had membranaceous and prolonged leaves and lilac flowers, like the plant extending into New England. Var. *pubescens* had milk-white flowers and seemed to be confined to brackish or saline habitats; its leaves, in the only collection we made, are like those of the essentially southern variety in being fleshy and scabrous, the pubescence not always abundant. The leaves of the variety are broader or more rounded-ovate than in most northern material. Var. *pubescens* is represented in the Gray Herbarium northward to Burlington Co., New Jersey.

Solidago puberula Nutt., var. pulverulenta (Nutt.) Chapm. (*S. pulverulenta* Nutt.). Apparently local: border of swamp, Pungo Causeway (mixed with typical S. puberula), *F. & G.*, no. 2944 (in part).

Some of the material quite unlike the usually more northern or inland *Solidago puberula* in having the upper leaves abruptly reduced in size, oblong and blunt. First from north of the Carolinas.

S. erecta Pursh. Common in dry soil: Cedar Hill, *F. & G.*, no. 2939; Cape Henry, *F. & G.*, no. 2940.

S. sempervirens L., var. **mexicana** (L.), comb. nov. *S. mexicana* L. Sp. Pl. ii. 879 (1753). Brackish shores, common: Kempsville, *F. & G.*, no. 2941.

Typical *Solidago sempervirens* abounds from the Gulf of St. Lawrence and the lower River St. Lawrence to southern New York and New Jersey, but south of New Jersey it occurs only locally to Virginia. Its fleshy leaves are quite smooth, without ciliolate margins, the lower leaves oblanceolate to spatulate-oblong and 1.2–7 cm. broad, its cauline leaves oblanceolate to lanceolate. The branches of its panicle are usually quite glabrous and the hemispherical heads are very large, with involucres 4–7 mm. high, while its flowers are large for the genus: pappus 3.5–5.5 mm. long; disk-corollas 4–5.5 mm. long; mature achenes 2.2–3.5 mm. long. In subtropical America, extending north on the Atlantic coast to southern New York and locally to southeastern Massachusetts, *S. mexicana* is at once distinguished by its narrower leaves and smaller heads. The basal leaves are linear- to oblong-lanceolate, rarely 3 cm. broad; the cauline linear-lanceolate and often quite acute, frequently ciliolate. The branches of the panicle are often hirtellous and the heads are mostly smaller than in the better developed *S. sempervirens*. I am, however, unable to separate the two as species.

As geographic varieties they are pronounced and in the more fleshy and broader leaves and quite glabrous foliage and branches the northern *S. sempervirens*, var. **typica** (*S. sempervirens* L. Sp. Pl. ii. 878 (1753)) reflects its concentration on the outer saline coast. Var. *mexicana*, with narrower and less fleshy leaves inclined to be scabrous-ciliolate and with hirtellous branches, shows a response to less saline conditions. Its habitats (at least northward) are inclined to be more brackish or inland than strongly saline or on the outermost coast, as indicated by the labels which give sufficient data: brackish marshes, Princess Anne Co., Virginia; Norfolk, Virginia; Queen's Creek, north of Williamsburg, Virginia; Curtis Bay, Anne Arundel Co., Maryland; along Gunpowder River, Maryland; sandy river-shore, Newcastle, Delaware; bank of Hudson R., Fishkill Landing, New York; shore of Lagoon Pond, Tisbury, Massachusetts; dry field at 100 feet elevation, north of Wakebee Pond, Mashpee, Massachusetts; open hillside, two miles from shore, north of Centreville, Massachusetts.

Much of the southern material of var. *mexicana* has been misidentified as *S. petiolata* Mill. (*S. stricta* Ait.; *S. angustifolia* Ell.). *S. petiolata*, however, has a stoloniferous base, very reduced upper cauline leaves and quite glabrous inflorescences.

S. PINETORUM Small. Occasional in dry soil: Barney's Corner, Princess Anne Co., no. 4234. Represented in the Gray Herbarium from Henrico Co. (West Hampton, *Randolph & Merriman*, no. 271) and from Pittsylvania Co. (Fall Creek, *Heller*, no. 1112), both distributed as *S. juncea* Ait.

Solidago pinetorum replaces *S. juncea* on the southeastern coastal plain, extending into the piedmont. It is quickly distinguished by its "triple-nerved" leaves, the basal only 5–17 mm. broad, its smaller heads and its glabrous or glabrate achenes. It was, apparently, included by Nuttall in his complex *S. missouriensis*, on account of the triple-nerved leaves: "Hab. Missouri, Arkansas, the Rocky Mountains, and near Chapel-Hill, North Carolina."—Nutt. Trans. Am. Phil. Soc. v. 327 (1837). The western and inland *S. missouriensis*, however, has abundant slender stolons, none of the material of *S. pinetorum* showing any tendency to produce them. *S. pinetorum* was thought by Kearney in 1901 to be an undescribed species; but, unfortunately, the species cannot now take his name: "**Solidago** sp. nov.? . . . Edenton, N. C., July 30 (Nos. 1897, 1900). Leaves distinctly triple-nerved; species intermediate between *S. juncea* Ait. and *S. missouriensis* Nutt."

S. TORTIFOLIA Ell. Local: depressions in clay fields, Rosemont, no. 4233.

Photo. E. C. Ogden.

GALIUM TRIFLORUM, var. ASPRELLIFORME: FIG. 1, flowering plant (TYPE), × 5/12. G. TRIFLORUM: flowering plant, × 5/12.

Photo. E. C. Ogden.

Gnaphalium calviceps: fig. 1, flowering plant (type), × 1; fig. 2, 1st year's rosette, × 1; fig. 3, involucres, × 5; fig. 4, tip of cauline leaf, × 10.

G. falcatum: fig. 5, inflorescence, × 1; fig. 6, glomerule of involucres, × 5; fig. 7, tip of cauline leaf, × 10.

G. pedunculosum: fig. 8, inflorescence of type, × 1, fig. 9, tip of cauline leaf, × 10.

ASTER UNDULATUS L. Infrequent: dry oak woods, Cape Henry, *F. & G.*, no. 2917.

ERIGERON PUSILLUS Nutt. Abundant in sandy soil: Cape Henry, *F. & G.*, no. 2915; False Cape, *F. G. & L.*, no. 4708.

PLUCHEA PETIOLATA Cass. Brackish marsh by Thurston Brook, Smith's Corner, Princess Anne Co., nos. 4248, 4249.

ANTENNARIA PARLINII Fern. Locally in borders of rich woods: Little Neck, no. 4240; Great Bridge, *F. & G.*, no. 4514.

A. FALLAX Greene. Local, at borders of rich woods: Little Neck, no. 4238.

A. SOLITARIA Rydb. Local, with the two preceding on Little Neck, no. 4239.

Chiefly a species of the interior. One of Clayton's specimens (his no. 287) of *A. solitaria,* from somewhere in Virginia, was included by Linnaeus under his *Gnaphalium plantaginifolium.*

GNAPHALIUM (§ GAMOCHAETA) **calvescens,** sp. nov. (TAB. 405, FIGS. 1–4), bienne; foliis rosulatis juvenilibus spathulato-oblanceolatis obtusis apice apiculatis brevissime pannoso-tomentulosis 1.3–4 cm. longis 0.6–1.2 cm. latis; caulibus subsimplicibus vel plerumque ramosis 1–2.5 dm. altis, ramibus valde adscendentibus gracilibus sericeis; foliis caulinis lineari-oblanceolatis falcatis apice acutis vel attenuatis subulato-mucronatis sericeo-tomentulosis imis 2.5–4 cm. longis 3–5 mm. latis, superioribus valde reductis glomerulis brevioribus vel eas paulo superantibus lineari attenuatis; capitulis stramineis glomerulatis glomerulis distantibus spicam interruptam gracilem 0.5–1 cm. crassam formantibus; involucris 3–4 mm. altis glabris vel subglabris basi vix lanatis; bracteis ca. 10, lineari-oblongis exterioribus subacutis interioribus obtusis 0.5 mm. latis; floribus fertilibus 5–6, imperfectis 12–15 ca. 4 mm. longis; achaeniis oblongis 0.5 mm. longis; pappi setis 12–15 longe barbellulatis 2–2.5 mm. longis; receptaculis denudatis planis papillatis.—VIRGINIA: sandy pinelands, The Desert, Cape Henry, July 28 and 29, 1934, *Fernald & Long,* no. 4245 (TYPE in Gray Herb.); dry open clay lands, Virginia Beach, July 27, 1934, *Fernald & Long,* no. 4244, June 21, 1935, *Fernald, Griscom & Long,* no. 4710.

It is with great hesitation that I propose another species of *Gnaphalium* § *Gamochaeta,* especially since the revision of the group in the Gray Herbarium and the publication by Dr. I. M. Johnston of six new species[1] of the section from Mexico. *G. calviceps,* however, stands apart from the other members of the group described from North America in so many characters that I am unable to identify it with any of them; nor can I match it even approximately with South American and Old World plants. When a detailed study of the entire group, with full knowledge of the types, can be made it may find a

[1] Johnston, Contrib. Gray Herb. lxviii. 98–101 (1923).

place under an already described species. The nearest allies, as I understand them, of *G. calviceps* are *G. falcatum* Lam., originally from Uruguay but extending north on coastal sands to South Carolina, and *G. pedunculosum* Johnston, of south-central Mexico.

Gnaphalium falcatum (fig. 5), however, is loosely tomentose; the leaves bluntly mucronate (fig. 7); the inflorescence thicker and more crowded, with prolonged leafy bracts with the larger involucres densely enmeshed in tomentum (fig. 6), with ovate outer involucral bracts; and with much longer pappus. Contrasted with *G. falcatum*, *G. calviceps* is closely sericeous-pannose or -tomentulose; its leaves (fig. 4) taper to more subulate tips; the open inflorescence has much smaller bracts, and its small involucres (fig. 3) are essentially glabrous except sometimes at base, and the outer bracts are much narrower.

Gnaphalium pedunculosum (fig. 8) has less mucronate leaf-tips (fig. 9); pedunculate, densely leafy-bracted subspherical glomerules, involucres larger (4–5 mm. high) with about 20 bracts, the outer bracts ovate; the flowers 50 or more, 2.5 mm. long; and the pappus-bristles only 6. It is quite unlike *G. calviceps* in all details.

In the region of Cape Henry *Gnaphalium calviceps* occurred with the wholly different *G. purpureum* L. Many plants were over-ripe but others were in fresh anthesis at the end of July (obviously extending into early August). *G. falcatum*, its nearest relative, perhaps, is represented in the Gray Herbarium by material from the sands of South Carolina, thence to Florida and Mississippi. All of it (some fully ripe) from South Carolina and Georgia was mature in April or early May, while that from Florida was collected in February and March. During our trip two strange plants particularly attracted us as very distinct. One was the *Hypoxis* which I have called *H. Longii*; the other the little *Gnaphalium calviceps*, strongly contrasted with *G. purpureum*, with which it was associated. I can appropriately name the first for one of its discoverers; the name of the second sufficiently suggests the other collector.

Polymnia Uvedalia L., var. floridana Blake, Rhodora, xix. 48 (1917). Occasional: dry clay of open woods and thickets, north of Blackwater River, Princess Anne Co., no. 4253.

Our material is a good match for the type, from Brevard Co., Florida. Blake restricted the variety to Florida, but it has a coastal plain dispersal northward to Delaware and westward to Alabama, the coastal plain specimens in the Gray Herbarium from these states and from Virginia (Williamsburg, *Grimes*, no. 4219), South Carolina

and Georgia all belonging to it; while the plant of the Piedmont and Appalachian region is Blake's var. *genuina*, with very glandular pedicels. Var. *floridana* lacks the abundant glands and has the pedicels pilose-hispid. The material, now more abundant than when he studied it, has the lobes and teeth of the leaves sharper than in var. *genuina*.

SILPHIUM TRIFOLIATUM L. Border of dry, mixed woods, Little Neck, Princess Anne Co., no. 4254, typical form with leaves in 3's; swampy woods, London Bridge, no. 4255 (leaves opposite or alternate). Collected also by Kearney.

A typical plant of the interior, here on the outer coastal plain.

BORRICHIA FRUTESCENS (L.) DC. Upper border of salt marsh, Wachapreague, Accomac Co., no. 4251.

BIDENS VULGATA Greene. Apparently infrequent: ditch near Back Bay, *F. & G.*, no. 2929.

HELENIUM TENUIFOLIUM Nutt. Clay field south of Seatack, no. 4256.

CACALIA ATRIPLICIFOLIA L. Frequent in dry woods and thickets: between Creed's and Back Bay P. O., no. 4258; Little Neck, no. 4259.

HIERACIUM VENOSUM L., var. BLOMBERGII Zahn. Frequent in sandy pinelands: Cape Henry, no. 4261.

EXPLANATION OF PLATES 384–405

PLATE 384. ASPLENIUM PLATYNEURON (L.) Oakes: FIG. 3, mature pinnae, showing confluent sori, × 1, from Little Creek, Virginia, *Fernald & Long*, no. 3602.

A. PLATYNEURON, var. EUROAUSTRINUM, n. var.: FIG. 1, plant, × 2/5, from Munden, Virginia, *Fernald & Long*, no. 3603 (TYPE); FIG. 2, mature pinna, showing remote sori, × 1, from the TYPE.

PLATE 385. SAGITTARIA WEATHERBIANA, n. sp.: FIG. 1, flowering plant and a second inflorescence, × ½, from north of Land of Promise, Virginia, *Fernald & Griscom*, no. 4297 (TYPE); FIG. 2, dilated filaments and long anthers, × 10, from the TYPE; FIGS. 3–6, mature achenes, × 10, from type-station, *Fernald, Griscom & Long*, no. 4536.

PLATE 386. SAGITTARIA WEATHERBIANA, n. sp.: FIG. 1, phyllodia, × 5/12, from Longwood Island, Waccamaw River, South Carolina, *Weatherby & Griscom*, no. 16,395.

S. GRAMINEA Michx.: FIG. 2, anthers, × 2, from Little Meteghan Lake, Nova Scotia, *Fernald & Long*, no. 23,174; FIGS. 3, 4 and 5, achenes, × 10, from Dune Park, Porter Co., Indiana, July 29, —, *D. C. Peattie*.

S. AMBIGUA J. G. Sm.: FIG. 6, stamens, × 10, from Joplin, Missouri, *E. J. Palmer*, no. 2130A; FIG. 7, achene, × 10, from Alba, Missouri, *E. J. Palmer*, no. 3061.

S. CYCLOPTERA (J. G. Sm.) Mohr.: FIG. 8, stamens, × 10, from Myers, Florida, *Hitchcock*, no. 371; FIGS. 9 and 10, achenes, × 10, from Fort Myers, Florida, *J. P. Standley*, no. 121.

S. LANCIFOLIA L.: FIG. 11, stamens, × 10, from Eustis, Florida, *Nash*, no. 124; FIGS. 12 and 13, achenes from Miragoane, Haiti, *Eyerdam*, no. 422.

S. FALCATA Pursh: FIG. 14, stamens, × 10, from Florida, *Biltmore Herb.*, no. 3300[a]; FIG. 15, achene, × 10, from Munden, Virginia, *Fernald & Long*, no. 3625.

Plate 387. Eleocharis ambigens, n. sp.: fig. 1, plant, × ⅖, from Dam Neck, Virginia, *Fernald & Long*, no. 3765 (type); figs. 2 and 3, spikelets, × 4, from the type; figs. 4 and 5, summit of sheath, × 10, from type; fig. 6, achene, × 10, from type; fig. 7, achene, × 25, from type; fig. 8, surface of achene, × 50, from type.

E. uniglumis (Link) Schultes: fig. 9, spikelet, × 4, from Anholt, Denmark, July 25, 1897, *Ove W. Paulsen;* fig. 10, summit of sheath, × 10, from same; fig. 11, achene, × 10, from same.

E. halophila Fernald & Brackett: fig. 12, spikelet, × 4, from Bonaventure River, Quebec, August 2–4, 1904, *Collins, Fernald & Pease* (type); fig. 13, summit of sheath, × 10, from type; fig. 14, achene, × 10, from type.

Plate 388. Forms of Fimbristylis puberula (Michx.) Vahl., × 1; all from flats back of the dunes, Rifle Range, south of Rudy Inlet, Virginia, *Fernald & Long:* fig. 4, F. puberula (typical), no. 3746; figs. 1 and 2, forma eucycla, n. f., no. 3750 (type); fig. 3, forma pycnostachya, n. f., no. 3752 (type).

Plate 389. Fimbristylis Baldwiniana (Schultes) Torr.: fig. 1, inflorescence, × 1, from Sand Bridge, Virginia, *Fernald & Long*, no. 3755; fig. 2, spikelet, × 5, of no. 3755; figs. 3 and 4, achenes, × 10, from no. 3757; fig. 5, inflorescence, × 1, from Northwest, Virginia, *Heller*, no. 760; fig. 6, spikelet, × 5, from no. 760; figs. 7 and 8, achenes, × 10, from no. 760; fig. 9, inflorescence, × 1, from Williamson, Pennsylvania, August 19, 1906, *Pennell* (*F. Darlingtoniana* Pennell); fig. 10, spikelet, × 5, from Williamson (*F. Darlingtoniana*); figs. 11 and 12, achenes, × 10, from Williamson (*F. Darlingtoniana*); fig. 13, inflorescence, × 1, from Rosemont, Virginia, *Fernald & Long*, no. 3756; fig. 14, inflorescence, × 1, from Goshenville, Chester Co., Pennsylvania, *Bartram*, no. 1213 (*F. Darlingtoniana*); fig. 15, spikelet, × 5, from no. 1213 (*F. Darlingtoniana*); figs. 16 and 17, achenes, × 10, from no. 1213; fig. 18, inflorescence, × 1, from Florida, *Torrey*, N. Am. Cyp.; fig. 19, spikelets, × 5, from Florida, *Torrey;* figs. 20 and 21, achenes, × 10, from same; fig. 22, inflorescence, × 1, from near Athens, Georgia, *Harper*, no. 68; fig. 23, spikelet, × 5, from no. 68; figs. 24 and 25, achenes, × 10, from no. 68; fig. 26, inflorescence, × 1, from Newcastle Co., Delaware, September, 1872, *Commons* (*F. Darlingtoniana*); figs. 27 and 28, achenes, × 10, from same; figs. 29 and 30, achenes, × 10, from West Chester, Pennsylvania, *Darlington* (*F. Darlingtoniana*); figs. 31 and 32, achenes, × 10, from Northwest, Virginia, *Heller*, no. 1249.

Plate 390. Rynchospora gracilenta Gray: fig. 1, plant, showing all leaves involute-capillary, × ⅖, from Bamber, New Jersey, August 25, 1909, *Bayard Long;* fig. 2, inflorescence, × 2, from same; fig. 3, achene, × 10, from Shark River, New Jersey, September 20, 1861, *Wm. Boott.*

R. gracilenta, var. diversifolia, n. var.: fig. 4, plant, showing flat cauline leaves, × ⅖, from Rifle Range, south of Rudy Inlet, Virginia, *Fernald & Long*, no. 3796 (type); fig. 5, inflorescence, × 2, from type; figs. 6 and 7, achenes, × 10, from type.

Plate 391. Rynchospora axillaris (Lam.) Britton (Schoenus axillaris Lam.): fig. 1, type of *S. axillaris*, × ¾, from photograph sent from Muséum National d'Histoire Naturelle, Paris, by Professor Humbert.

R. cephalantha Gray: fig. 2, inflorescence, × 1, from Pine Barrens of New Jersey, *Torrey* (type); fig. 3, achene, × 10, from type.

R. microcephala Britton: fig. 4, inflorescence (folded back), × 1, from south of Grassfield, Norfolk Co., Virginia, *Fernald & Long*, no. 3785; fig. 5, achene, × 10, from Salisbury, Maryland, September 28, 1863, *Commons.*

Plate 392. Uvularia puberula Michx.: fig. 1, exceptionally small fruit, × 1.8, from Cove Road, Craig Co., Virginia or Monroe or Allegheny Co., West Virginia, *Steele & Steele*, no. 268; fig. 4, flower, showing long style, × 1.8, from White Sulphur Springs, West Virginia, May, 1914, *F. W. Hunnewell;* fig. 5, flower, showing long anthers, × 1.8, from same collection as fig. 4; fig. 7, lower surface of leaf, by reflected light, showing elevated reticulation (with shadows), × 5, from Henderson Co., North Carolina, *Wiegand &*

Manning, no. 856; FIG. 8, reticulation of same leaf (cf. FIG. 6), × 5, by transmitted light.

U. PUBERULA, var. NITIDA (Britton) Fern.: FIG. 2, flower, showing long style, × 1.8, from South Lakewood, New Jersey, *Mackenzie*, no. 4556; FIG. 3, flower, showing long anthers, × 1.8, from Tom's River, New Jersey, May 30, 1907, *Eggleston;* FIG. 6, lower surface of leaf, by reflected light, showing reticulation not elevated (no shadows), from Tom's River, New Jersey, May 31, 1887, *N. L. Britton* (one of original specimens)—cf. FIG. 8.

PLATE 393. HYPOXIS LONGII, n. sp., all figs. from Rifle Range, Virginia, *Fernald & Long*, no. 3862 (TYPE): FIG. 1, fruiting plant, × 1; FIG. 2, flower, × 5; FIG. 3, flower mechanically spread open, × 10; FIG. 4, summit of fruit, × 10; FIG. 5, dehisced fruit, with seeds, × 10; FIG. 6, valves of dehisced capsule, × 10; FIGS. 7 and 8, seeds, × 12.

PLATE 394. CARPINUS CAROLINIANA Walt.: FIG. 1, tip of fruiting branch, × 1, from Rock Bluff, Liberty Co., Florida, *Wiegand & Manning*, no. 972; FIG. 2, bract and fruit, × 2, from no. 972; FIG. 3, bract and fruit, × 2, from Vienna, Johnson Co., Illinois, *Gleason*, no. 2289; FIG. 4, bract and fruit, × 2, from southwest of Five Forks, James City Co., Virginia, *Randolph & Randolph*, no. 411; FIG. 5, bract and fruit, × 5, from Mars Bluff, Florence Co., South Carolina, *Wiegand & Manning*, no. 970; FIG. 6, leaf-margin, × 5, from Ocean Springs, Mississippi, *Tracy*, no. 6892; FIG. 7, leaf-margin, × 5, from Tallahassee, Florida, *Nash*, no. 2340; FIG. 8, leaf-margin, × 5, from near Blackwater River, Virginia, *Fernald & Long*, no. 3894; FIG. 9, leaf-margin, × 5, from Elizabeth City, North Carolina, *Wiegand & Manning*, no. 969; FIG. 10, leaf-margin, × 5, from Gibson, Glascock Co., Georgia, *Harper*, no. 1322.

PLATE 395. CARPINUS CAROLINIANA, var. VIRGINIANA (Marsh.) Fern.: FIG. 1, tip of fruiting branch, × 1, from Franklin, Connecticut, September 16, 1906, *R. W. Woodward;* FIG. 2, bract and fruit, × 2, from Sidney, Maine, *Fernald & Long*, no. 13,443; FIG. 3, bract (transitional) and fruit, × 2, from Gossan, Carroll Co., Virginia, July 12, 1892, *Small;* FIG. 4, bract and fruit, × 2, from Redding, Connecticut, *Weatherby*, no. D2717; FIG. 5, leaf-margin, × 5, from Easton, Pennsylvania, July 15, 1897, *Porter;* FIG. 6, leaf-margin, × 5, from Fayette, Iowa, July, 1894, *Fink;* FIG. 7, leaf-margin, × 5, from Sidney, Maine, *Fernald & Long*, no. 13,443.

PLATE 396. LINUM: plants, × ¾; leaves, × 5; details of leaf-venation, × 10; capsules, × 5; ripe carpels, × 8.

LINUM MEDIUM (Planch.) Trel.: FIG. 1, small fruiting plant, from Stokes Bay, Bruce Co., Ontario, *Krotkov*, no. 7570; FIG. 2, capsule, from no. 7570; FIG. 3, leaf, from no. 7570; FIG. 4, portion of leaf (opaque), illuminated by transmitted light, from no. 7570; FIG. 5, ripe carpels, from no. 7570.

LINUM MEDIUM, var. TEXANUM (Planch.) Fern.: FIG. 6, small plant, from Virginia Beach, Virginia, *Fernald & Long*, no. 3989; FIG. 7, capsule, from no. 3989; FIG. 8, leaf, from no. 3989; FIG. 9, portion of leaf, by transmitted light, from no. 3989; FIG. 10, ripe carpels, from no. 3989.

L. FLORIDANUM (Planch.) Trel.: FIG. 11, leaf, from Duval Co., Florida, *Curtiss*, no. 412; FIG. 12, center of leaf, by transmitted light, from no. 412; FIG. 13, fruit, from Sumter Co., Georgia, *Harper*, no. 1026; FIG. 14, ripe carpels, from Brevard Co., Florida, *Fredholm*, no. 6157.

L. INTERCURSUM Bickn.: FIG. 15, leaf, from West Tisbury, Martha's Vineyard, Massachusetts, *F. C. Seymour*, no. 1251; FIG. 16, center of leaf, by transmitted light, from no. 1251; FIGS. 17 and 18, capsules, from Little Neck, Virginia, *Fernald & Long*, no. 3992; FIG. 19, ripe carpels, from Nantucket, Massachusetts, August 29, 1904, *Bicknell.*

PLATE 397. NYSSA SYLVATICA Marsh, var. TYPICA: FIG. 1, fruiting branch, × 1, showing characteristic leaves and long fruiting peduncles, from Dam Neck, Virginia, *Fernald & Long*, no. 4099; FIG. 2, lower surface of leaf, × 10, from no. 4099; FIG. 3, staminate inflorescence, × 3, showing the short pedicels, from Brookline, Massachusetts, *Faxon.*

PLATE 398. NYSSA SYLVATICA Marsh., var. BIFLORA (Walt.) Sarg.: FIG. 1, fruiting branch, × 1, showing the short peduncles, from Cape Henry, Virginia,

Fernald & Long, no. 4096; fig. 2, staminate inflorescence, × 3, from Greensboro, Alabama, 1887, *S. Watson*.

Plate 399. Nyssa sylvatica Marsh., var. dilatata, n. var.: fig. 1, portion of fruiting branch, × 1, from the type, Hartwell, Hart Co., Georgia, *Wiegand & Manning*, no. 2339; fig. 2, staminate inflorescence, × 3, from near Sebring, Highland Co., Florida, *F. W. Hunnewell*, no. 9021.

Plate 400. Nyssa sylvatica Marsh., var. caroliniana (Poir.) Fern.: fig. 1, fruiting branch, × 1, from Hanging Rock, Hampshire Co., West Virginia, *F. W. Hunnewell*, no. 10,705; fig. 2, lower surface of leaf, × 10, from no. 10,705; fig. 3, staminate inflorescence, × 3, from Biltmore, North Carolina, *Bilt. Herb.*, no. 662^b.

Plate 401. Bacopa Monnieria (L.) Wettst., var. cuneifolia (Michx.) Fern.: figs. 1 and 2, summits of erect plants, × 1, from False Cape, Virginia, *Fernald & Long*, no. 4185; fig. 3, flowers, × 3, showing broad and blunt large sepals, from no. 4185; fig. 4, flower, × 3, showing broad and blunt large sepals and corolla-lobes, from Dam Neck, Virginia, *Fernald & Long*, no. 5183; fig. 7, terminal leaves, × 3, showing dentation, from Montgomery, Georgia, *Harper*, no. 1826.

B. Monnieria: fig. 5, plant, × 1, from vicinity of St. Michel de l'Atalaye, Dépt. du Nord, Haiti, *Leonard*, no. 7041; fig. 6, fruit, × 3, showing narrow and acutish calyx-lobes, from Miragoane, Haiti, *Eyerdam*, no. 563.

Plate 402. Phryma Leptostachya L., var. confertifolia, n. var.: fig. 1, plant, × 1, from Little Neck, Virginia, *Fernald & Long*, no. 4197 (type).

P. Leptostachya: fig. 2, leaf, × 1, from Fayette, Iowa, July, 1894, *Fink*.

Plate 403. Galium tinctorium L.: fig. 1, type in Linnean Herbarium, × 1, from photograph supplied by Mr. S. Savage; fig. 2, flowering branch, × 1, of *G. Claytoni* Michx., from Conquest, New York, *Wiegand*, no. 7172.

Galium obtusum Bigelow: fig. 3, flowering branch, × 1, of *G. tinctorium* Wiegand, not L., from Conquest, New York, *Metcalf & Wiegand*, no. 7179.

Plate 404. Galium triflorum Michx.: fig. 2, characteristic small plant, × 5/12, from Brig Bay, Newfoundland, *Fernald, Long & Dunbar*, no. 27,096.

G. triflorum, var. asprelliforme, n. var.: fig. 1, flowering plant, × 5/12, from near Great Bridge, Virginia, *Fernald & Long*, no. 4205 (type).

Plate 405. Gnaphalium calviceps, n. sp.: fig. 1, flowering plant, × 1, from Cape Henry, Virginia, *Fernald & Long*, no. 4245 (type); fig. 2, 1st year's rosette, × 1, from the type; fig. 3, involucres, × 5, from the type; fig. 4, tip of cauline leaf, × 10, from the type.

G. falcatum Lam.: fig. 5, inflorescence, × 1, from the type-region, Montevideo, Uruguay, *Herter*, no. 200, in part; fig. 6, glomerule, × 5, from Dept. de Andalgalá, Prov. de Catamarca, Repub. Argentina, *Jorgensen*, no. 1101; fig. 7, tip of cauline leaf, × 10, from Uruguay, *Herter*, no. 200.

G. pedunculosum Johnston: fig. 8, inflorescence, × 1, from Otinapa, Durango, Mexico, *Edw. Palmer*, no. 411 (type); fig. 9, tip of cauline leaf, from the type.

Tradescantia Wrightii in New Mexico.—Since its description in 1904 *Tradescantia Wrightii* Rose & Bush[1] has been considered a strictly endemic species of the Guadalupe Mountains of Texas; positively known, as a matter of fact, from a single canyon in Culberson County. While a recent revision[2] of the species of *Tradescantia* was in press Hubricht collected the same species in abundance in Lincoln County, New Mexico, about two hundred miles north of the region of its occurrence as previously known in southwestern Texas.

[1] Trans. Acad. Sci. St. Louis **14**: 188. 1904.

[2] E. Anderson & Woodson, Contrib. Arnold Arb. IX. 1935.

The plants were found at an altitude of about 6700 feet elevation on a limestone glade with a gentle southwestern slope, in open places among junipers, about 2 miles southwest of Corona. Living plants are now cultivated at the Missouri Botanical Garden, and exsiccatae are incorporated in the herbarium.

The plants correspond in every way to those of *Wright 701*, the type specimen in the United States National Herbarium. It is very important to note that the few leaves of the living plants are very fleshy; almost terete with a slight ventral groove over the midrib, and with a very slight glaucous cast, an important criterion to aid in the separation of living specimens from those of the closely neighboring *T. occidentalis* (Britton) Smyth var. *typica* and *T. pinetorum* Greene.—R. E. Woodson, Jr. and Leslie Hubricht, Missouri Botanical Garden, Saint Louis, Mo.

Plants apparently new to Mount Katahdin, Maine.—Picea glauca (Moench.) Voss. A mature plant bearing new cones, on the southern slope of the North Mountain was found by the writer in 1926. This old "tree" was closely appressed to the ground, like the procumbent cedar.

Glyceria melicaria (Michx.) F. T. Hubb. At a point where the road to Basin Ponds approaches Roaring Brook just below the Basin Ponds, I collected this grass from a dense mass at the edge of the brook, in 1923. Altitude about 2300 feet.

Carex oligosperma Michx. Collected at Pomola Pond in 1923 by Mrs. J. H. Blake. Altitude about 2300 feet.

Carex Michauxiana Boeckl. I found a thriving colony of this sedge at the foot of Pomola, where two eastern forks of Avalanch Brook meet and form a muddy puddle. Altitude about 2400 feet. This point is near the foot the eastern slide.

Osmorhiza obtusa (Coulter & Rose), Fernald. I have found this in good condition in South Basin, between Basin Ponds and Saddle Slide, at several points. L. H. Harvey (1903[1]), mentions "*Osmorhiza* sp.?" as seen in Northwest Basin.—Arthur H. Norton, Museum of Natural History, Portland, Maine.

Volume 37, no. 443, including pages 373–416 and plates 383–393, was issued 9 November, 1935.

[1] 1903, L. H. Harvey, Rhodora 5: 49.

ERRATA

Cover no. 439, line 6; *for* forms *read* forma.
Cover no. 443, line 9; *for* **No. 442** *read* **No. 443.**
Page 39, line 14; for *Floorkeana* read *Floerkeana.*
Page 61, line 7; *for* PL. 0 *read* PL. 326.
Page 110, line 2; *for* FIG. e *read* FIG. j.
Page 117, line 18; *for* TURGIDUS *read* TURGIDA.
Page 129, line 10; *for* 232–251 *read* 332–351.
Page 130, line 38; for *Oxydendron* read *Oxydendrum.*
Page 151, line 29; for *stenopelis* read *stenolepis.*
Page 161, line 17; *for* LATOFOLIUM *read* LATIFOLIUM.
Page 171, line 4; *for* Columbia *read* Colombia.
Page 182, line 5; *for* Androscaggin *read* Androscoggin.
Page 218, line 13; for *Adencaulon* read *Adenocaulon.*
Page 273, line 5; *for* better *read* sometimes.
Page 284, line 11; for *nutkanas* read *nutkanus.*
Page 291, line 37; *for* which has *read* which, it would seem, has.
Page 291, line 38; omit *P. pensylvanica.*
Page 306, line 17; for *Euphorbiacea* read *Euphorbiaceae.*
Page 311, line 31; for *polypodiodes* read *polypodioides.*
Page 315, line 9; *for* NEPHENTHOIDES *read* NEPENTHOIDES.
Page 410, line 15; *for* Breat *read* Great.
Page 414, line 22; *for* The only *read* Four of the.
Page 414, line 22; *for* locality *read* localities.
Page 414, line 23; *for* is *read* are.
Page 414, line 24; *for* a station *read* stations.
Page 414, line 25; *after* miles *add* or more.
Page 415, line 19; *for* HEXAGANOPTERA *read* HEXAGONOPTERA.

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